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Electricity as a Present-Day Necessity

A considerable portion of the change in attitude of the public toward electric service companies during the past decade is attributed by State Senator Willard Howland, of Massachusetts, to the increasing belief that electricity is no longer a luxury to be enjoyed by the wealthy few but has become an everyday necessity for the rich and poor alike. The increased severity of the demands made upon public utility corporations now as compared with some years earlier, when the men willing to risk their money in electrical undertakings were looked upon as benefactors, is doubtless attributable somewhat to the cause mentioned by Senator Howland, augmented in some quarters by the belief that the rates of electric service companies are so arranged as to benefit the rich at the expense of the poor. To just what extent central-station managers will be willing to agree with Senator Howland it is difficult to predict, but no one can doubt the wisdom of considering seriously the idea brought forward by him. Perhaps it may be found that while holding strongly the opinion that electricity is a present-day necessity in all walks of life, many managers have so conducted their business as to leave the impression on their less wealthy customers that electricity is a luxury they cannot afford and that the seemingly high cost of service intended only for the rich is of little concern to those able to purchase merely necessities. Obviously what is needed is a campaign of education; the public must be made to understand the service problems of the utility corporations, and the companies must be taught the needs of the public. It is in work of this nature that the Society for Electrical Development can prove invaluable alike to the public and to the corporations.

The Regulative Idea in Wisconsin

In his address at the Association Island meeting Chairman Roemer of the Wisconsin commission presented the fair, reasonable point of view which from the beginning has generally been characteristic of the official utterances of members of this commission. Many of the states have copied parts of the laws of Wisconsin for the regulation of public utilities; if they would also follow as wise a policy as it has in the selection of commissioners and seek to preserve as even a balance as its commission has, in the main, the issues between the public and the companies would be less acute than they are. The Wisconsin commission has not pleased all of the companies; it has not pleased all of the public; but it has tried to produce results that would work toward the settlement of differences between the two interests and the removal of their contentions from the arena of politics. In so doing it has trodden upon vested rights. But it has not set out with a fixed purpose of interfering with such rights. It has not abated the closeness of its supervision of the properties, but it has considered their needs as well as the needs of the public. If more laxity had entered into the regulative practices of the commission, there might have been greater progress in the construction of properties, particularly in those districts of the State which are not closely settled, but we do not know that such would have been the fact nor do we know that the best and permanent interests of the State would have been promoted by such a policy. If regulation is to be a lasting success in Wisconsin and elsewhere, it must prove its success by its effectiveness. It will be effective in the degree in which it protects the reasonable interests of both the public and the companies and at the same time provides working conditions which assure good service at rates that perpetuate the properties and conserve the legitimate investment which produced these properties and made them capable of rendering service of high standard.

The Beneficent Electric Sign

Electric signs and electric-lighted billboards are among the culprits summoned to face a severe arraignment as advertising nuisances in the report just submitted by New York's billboard commission. The stringent rules which this body proposes for New York City would prohibit all outdoor advertising—except shop signs—in the vicinity of parks, public buildings and certain streets, and would prevent the operation of large or flashing electric signs in residential districts. Furthermore, a tax is recommended on all outdoor advertising, and it is proposed that moral and esthetic censorship be provided for regulating the character of the displays. No sensitive observer can conscientiously defend some advertising atrocities which mar the streets of American cities, but most electric signs, we feel very strongly, deserve a measure of immunity from this general attack, in consideration of the other benefits they confer on their communities. Chief among these, of course, is the electric sign's supplementary service in lighting the streets. There are cities in this country whose connected sign load is actually double the entire kilowatt rating of the local street-lighting system, and in the average progressive community this ratio is at least unity. Most of these sign lamps are directly effective as free public-lighting sources; this practical fact is attested by the ordinances of certain cities which permit electric signs only, absolutely prohibiting all "dead" signs. In the beforementioned residential sections, too, which are usually poorly lighted, electric signs and lighted billboards certainly contribute to the safety of late home-comers and timid householders. Nor should esthetic legislators and their advisers

overlook the business-creating values of electric displays and their direct bearing on the commercial activity and prosperity of their vicinities. The street with the flaring sky-line is always the one most traveled after dark, and a city's connected sign load is invariably the index of its progressiveness. By night most of our big electric signs, one may add, are spectacles of real beauty and artistic design, and we believe that the improvement thus noted is rapidly extending to smaller signs as well. If esthetic criticism is in order, it might be directed at the daylight appearance of the great steel structures properly required by city building departments to support roof and overhanging signs, for here is a place where some architectural veneer is badly needed. In this, as in other respects, the services of an intelligent regulative censorship might be of great use to the public and to the electric-sign industry itself, but we must enter a vigorous protest against any such unjust prohibitory measures as are proposed by the metropolitan commission.

Mr. Vanderlip's Appreciation of the Electrical Industry

The stupendous totals of electrical capital and energy used by Mr. Vanderlip in his Association Island address are not new, but the glowing appreciation of them by a banker of highest rank gives a new realization of the strength and stability of the properties that compose the electrical industry. The various classes of these properties are so diversified that even to those who ought to be familiar with the general totals of business and capital investment in electrical fields the figures gain impressiveness by study, and to those who have not been familiar with past achievements and future possibilities the statistics will be a revelation. Naturally the address presents the point of view of the metropolitan banker. It is a narrative of progress, a critical review of the past and a prophecy for the future from the outside rather than from the inside of the industry. The speaker was deeply impressed by the totals of electrical investment, he was concerned about the problems which bear upon the question of fresh capital needs, and he was insistent in pointing out the responsibility which rests upon managers so to conduct their operations as to win and hold public regard.

The capital requirements of central stations during the last period of five years, as estimated by Mr. Vanderlip, were $900,000,000, or an average of $180,000,000 a year. Adding thereto the requirements of allied industries operating electrically, he figures that for the next period of five years the needs will average $400,000,000 annually, or, roughly, $8,000,000 a week. These conditions urgently demand consideration. The cost of financing an industry at its birth and until it reaches that mature period when its securities become "seasoned," as the bankers say, is high. It should become lower, however, as the industry progresses on the normal way toward stability. The high cost of financing is exacted by the bankers through the medium of a large discount on bonds, a bonus in securities or an excessive rate of interest. Much as a new industry may rebel against the charges of bankers it must admit that it is exploiting new fields and that it cannot refer to the past for any definite assurance of what the future will bring forth in regard to its permanent tenure of usefulness. Such was the situation in the electrical industry in the early days. The more recent development of the inherent great possibilities of the industry has carried the properties vigorously past those times.

There is no reason now why electrical properties should be regarded anywhere as experimental. There is every reason why the operators of the properties should see to it that they occupy a position of equal importance with the established companies of other classes whose securities stand high in public favor. The attainment and the permanent retention of this desirable result are dependent to a large degree, as Mr. Vanderlip indicates, upon the condition of the companies with reference to all matters of public policy. Certainly the companies can, or ought to, occupy a position of greater independence in their dealings with bankers for the sale of securities. Their physical properties are well developed, they meet a well-established public demand for service, and generally their revenues increase in leaps and bounds. The widespread acceptance of these factors gives the companies a lever with which they can move the banker as well as the investor to the acceptance of public utility properties as more desirable borrowers and thus keep their costs of property lower than they have been in the past.

We believe that Mr. Vanderlip miscalculates when he estimates that four out of five investors at the present time have their minds closed against any investment in securities of electrical undertakings and that this is true largely because they fear the effect of present political conditions and tendencies. If so serious a proportion of private investors had turned their faces against electrical properties, the industry would have been hampered so that failure rather than phenomenal success would have been its present condition. Perhaps Mr. Vanderlip, because of the very largeness of the investment units with which he is accustomed to deal, overlooks the situation in thousands of plants throughout the country whose securities are held mainly at home or are scattered in relatively small amounts elsewhere. Save in a comparatively few instances the central stations do not borrow in the large amounts which financial transactions of great steam railroad companies make familiar. However, where a prejudice or a feeling born of fear exists against electrical properties, the companies should certainly take steps to reveal themselves in the right light or try to remove such causes of fear as may exist.

No small part of the thanks which the industry owes to Mr. Vanderlip for his critical analysis is due to his cautionary words in regard to the treatment of the general public. Because it was a message to the industry, not to the public, the paper did not contain any similar cautionary words addressed to the public. It recognizes, however, that two separate parties are involved and that each has a duty to the other. Public service commissions, if conducted in the right spirit, will be a greater help in the considerate discharge of these respective duties than any other that can be secured.

The International Illumination Commission

The International Photometric Commission, which was commonly called the Zürich commission, met at Berlin in the last week of August, 1913, and became converted into the International Illumination Commission, with a new constitution and an enlarged representation. Ten countries in all were represented by delegates, many of whose names are well known in all gatherings of photometrists. The new commission, after its decisions shall have been ratified by the various underlying national societies, will start on its career with officers, offices and a budget, all complete, and everywhere everyone interested in illumination will cordially wish it success.

The successful launching of the new commission is the more satisfactory because it has been accomplished through the medium of the preceding Zürich commission, which, although somewhat restricted in its organization, was at least an international body. It is clearly more suitable that the new commission should have been formed by proper enlargement of the previously existing international photometric commission than by forming an entirely new organization and thus leaving two separate international bodies in the field with similar yet unassociated purposes. The success of this difficult task of enlargement has been due in no small measure to the efforts of Dr. E. P. Hyde, of the American committee, who is one of the new vice-presidents.

A noteworthy feature in the constitution of the new International Illumination Commission is the fact that it has no official language or languages. It has one and only one basic language, but three recognized languages. All of the statutes, resolutions and official documents of the commission are to be internationally drawn up, agreed upon and promulgated in the basic language, which is French, while the national committees which use the recognized languages—thus far German and English—draw up translations, which are open to publication on their own respective responsibilities. In this way, discussions in the meetings, which may be in any or all of three languages, are directed solely toward securing international purposes expressed entirely in the French text, which stands as the reference text. The secretary's office has only to see that this text is faithfully recorded and printed in all the publications that may be issued from time to time. Translations of the French text into English and German can readily and conveniently be made by local national committees and may be printed along with the French text for the convenience of the various countries receiving reports, but in case of any question arising as to the precise meaning of phraseology, reference is to be had immediately to the basic text, upon which decision is to be rendered. Papers, discussions and communications from individual committees are acceptable in any of the three recognized languages; but if these lead to international action, the action will be recorded in the basic language.

The above-described agreement upon a single language as a basis of record, accompanied by freedom in selection from several languages as mediums of communication and discussion, constitutes in our opinion a great step in international organizations for applied science. It simplifies very greatly the work of legislative construction, of editing and of official publication, without the sacrifice of any useful principle. In the attainment of this notable result Mr. C. O. Mailloux, of the American committee, contributed great service to international co-operation. It is doubtful whether such a harmonious result could have been secured at this date in any international gathering outside of science or technology.

Another valuable international asset that has been gained in the constitution of the new commission, as set forth in its statutes, is that whereas internationally official resolutions must all be recorded by vote according to nationality, each country being allowed one and only one vote, no matter how many delegates it may send, yet in the sectional meetings, where technical matters are discussed, the voting is to be by individuals and not by countries, although all votes calling for international action must subsequently be ratified in plenary meeting, by countries. Consequently, while the statutes, resolutions and international actions of the commission are to be made by countries through their individual votes, it is the man and not the country that receives recognition in considering technical questions.

Seeing that the presidency of the new commission remains most properly in the hands of M. Vautier, the president of the old commission, and that French has been adopted as the basic language of the commission, the decision was most wise and expedient to place the secretary's office in England, and Mr. C. C. Paterson, as the new honorary secretary, thus receives worthy recognition for his labors in acting as secretary of the international committee which drew up the proposed constitution out of which the final statutes were successfully constructed.

Company Teamwork

A broadened view of the commercial department's duties is presented in the interesting paper by Miss Sheridan, sales manager for the Detroit Edison Company, abstracted on a following page. Besides considerably amplifying the scope of the sales staff as usually conceived, the author points out the need for intelligent co-operation between central-station departments, emphasizing that such collateral divisions should obtain a better understanding of their own and each other's work in relation to the whole. The plan which has been so successful at Detroit not only involves granting some measure of authority to the sales department by which it can impress its necessities on other divisions but also includes the more important idea of educating the mechanical and accounting staffs up to the customer's viewpoint, showing them why their own precedents, routine or convenience must sometimes be sacrificed to the larger good of the company's service. Through his intimate contact with the public the salesman usually has in a high degree this appreciation of the "human touch," but in the more remote departments the men too often content themselves with doing their work in their own way, giving little thought to the public, which, after all, they are working to serve. Miss Sheridan's lesson of co-operation and mutual understanding deserves to be taught painstakingly throughout the central station's forces.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Tariff Bill Passed by the Senate

The United States Senate passed the tariff revision bill on Sept. 9 by a vote of 44 to 37. Senator Poindexter, a Progresssive, and Senator La Follette, a Republican, voted with the Democrats in favor of the measure. Senators Ransdell and Thornton, of Louisiana, both Democrats, voted against the measure. The bill will now be considered in conference by committees of the Senate and the House of Representatives. It is estimated that ten days will be required for the consideration of the bill in this way.

President Wilson issued a statement in regard to the action on the bill in which he said: "A fight for the people and for free business, which has lasted a long generation through, has at last been won, handsomely and completely. I am happy to have been connected with the government of the nation at a time when such things could happen and to have worked in association with men who could do them."

Pennsylvania Electric Association

The sixth annual convention of the Pennsylvania Electric Association will be held at Delaware Water Gap, Pa., Sept. 16, 17 and 18. Among the papers scheduled for the sessions are the following: "Rates," Mr. R. H. Conklin; "Rules and Regulations for Outside Employees," Messrs. S. W. Brown and James A. Metz; "Rules for Station Operation," Mr. Ira G. Walborn; "Boiler-House Practice," Mr. Thomas G. Coughlan; "Feeder Regulators," Mr. A. D. Fishel, and "Street Lighting," Mr. Preston S. Millar. Reports will also be rendered by the committees on lamps, welfare work and public-utility interconstruction. The Hon. Frederic W. Fleitz will deliver an address on "Public Service Company Law" at the executive session of Wednesday afternoon. Mr. Van Dusen Rickert, Pottsville, Pa., is president of the association, which is a state branch of the National Electric Light Association, and Mr. Walter E. Long, 1000 Chestnut Street, Philadelphia, Pa., is secretary.

Third International Congress of Refrigeration

The Third International Congress and Exposition of Refrigeration, to be held in Chicago Sept. 17 to Oct. 1, will be marked by a large delegation of prominent scientists, experts and practical operators of refrigerating plants, representing more than forty of the principal governments of the world. During the week of Sept. 8 delegates from abroad have been received in New York City, where they have been entertained with inspection trips to local plants and at several social affairs. On Sept. 15 they will visit Washington, where a reception will be tendered to them by the President of the United States and the Secretary of Agriculture.

The delegates will then leave for Chicago for the first technical session of the congress, which will open Wednesday, Sept. 17. Arrangements have been made for half-day sessions, consisting of six sections to be held in the Hotel La Salle. Simultaneously the International Refrigeration Exhibition will be held in the International Amphitheater at the stock yards. For discussion at the sessions a large number of papers have been submitted by both foreign and American delegates. Each will be printed in English, French and German, and discussions will be conducted in these languages, as well as in Italian and Spanish, with the aid of interpreters.

From ten to twenty-five subjects are to be treated under each of the following general section topics: (1) physics, chemistry and thermometry; (2) design, construction, operation and methods of testing refrigerating machinery and insulating material; (3) application of refrigeration to preservation of foods; (4) use of refrigerating apparatus in the industrial arts; (5) consideration of refrigeration in railway and steamship transportation; (6) consideration of questions relating to legislation and administration.

Dr. Frank W. Gunsaulus, of the Armour Institute, Chicago, is president of the International Congress of Refrigeration, and Mr. J. F. Nickerson, of Chicago, is secretary-general. Arrangements have been made for the accommodation of about 4000 delegates.

Lake George Convention, Eastern New York Section, N. E. L. A.

At the Hotel Sagamore, Lake George, N. Y., Monday, Sept. 15, the Eastern New York Section of the National Electric Light Association will hold its annual meeting. The opening address is to be delivered by Mr. Elmer J. West, of the Adirondack Electric Power Company, Glens Falls, and papers will be presented as follows: "Public Policy," Mr. William McClellan, formerly engineer New York Public Service Commission, Second District; "Estimating the Comparative Value of Electric Vehicles and Other Methods of Transportation," Mr. C. S. Van Dyke, Schenectady Illuminating Company; "Resuscitation," Dr. C. A. Lauffer, medical director Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., and "Illumination of the Panama-Pacific International Exposition at San Francisco," Mr. W. D'A. Ryan, illuminating engineer, General Electric Company, Schenectady. Mr. A. T. Thorp, Utica, N. Y., is president of the Eastern New York Section, and Mr. R. E. Russell, Schenectady, is secretary. An extensive amusement program, including motor-boat trips, fishing, swimming, tennis, baseball and dancing, has been arranged by the entertainment committee, of which Mr. Lee Hagood is chairman.

Meeting of Electrical Supply Jobbers

The Electrical Supply Jobbers' Association held its quarterly convention at the Hotel Clifton, Niagara Falls, Ontario, Sept. 9, 10 and 11. Nearly 300 jobbers, manufacturers and representatives were present.

Aside from the scheduled sessions there was an open meeting on Sept. 9 at which Mr. Douglass Burnett, Baltimore, Md., vice-chairman of the Commercial Section of the National Electric Light Association, made an address describing the success met by progressive central stations with their commercial and merchandising campaigns. Mr. Burnett read excerpts from several papers presented before the Commercial Section at the Chicago convention in

June and pointed out some of the things already accomplished by the Consolidated Gas & Electric Company of Baltimore, for which he is sales manager. He also referred to the possibilities of the Society for Electrical Development in furthering the success of such efforts.

Mr. W. E. Robertson, of Buffalo, N. Y., also spoke, pointing out to the jobbers the advantages of the Electrical Development Society to them as well as to the other branches of the electrical industry. Mr. C. P. Hill, of the Doubleday-Hill Electric Company, Pittsburgh, Pa., also spoke.

The next meeting of the jobbers' association will be held at Hot Springs, Va., Nov. 18 to 20.

Convention of Edison Illuminating Companies

By Telegraph

The thirty-fourth convention of the Association of Edison Illuminating Companies was held at the Hotel Otesaga, Cooperstown, N. Y., Sept. 8, 9, 10, 11 and 12. Never before in the history of the association was there such a gathering of the notable men of the electric-lighting industry. The registration list totaled over 360, and it was necessary to distribute the delegates in three hotels, the Otesaga not being large enough to accommodate all. Although the association numbers only about seventy-four member companies, they are located chiefly in the large cities and represent the cream of the industry, and the conventions, though in a measure exclusive, are really noteworthy events. Certainly no other body engaged in the lighting business commands such an array of talent or places before its membership more interesting or instructive papers.

High-Efficiency Lamps

The association is, of course, vitally interested in the prospective development of higher efficiency incandescent lamps and the future promises of cheaper light, with consequent marked reductions of income probably in some classes of service. This is one of the great problems of the industry at present, and the association is fortunate in having in charge of its lamp questions an exceptionally able committee, which is well informed and capable of giving the member companies wise and constructive guidance.

The report of the lamp committee was the most important event of the week. In connection with the report the manufacturers of incandescent lamps told of the progress made in the art of lamp making and showed a lamp giving approximately 5000 cp. In addition, Mr. George Claude, of France, told of his work with the neon lamp and showed a lamp giving orange-red light having a specific consumption of about 0.5 watt per candle.

President Williams' Address

The regular sessions of the convention began on Tuesday morning, opening with the address of President Arthur Williams of the New York Edison Company. Mr. Williams reviewed briefly the early history of the association and the developments in the incandescent-lighting art, saying that just as a few years ago the amount of energy necessary for a given volume of light was reduced one-third so to-day there are distinctive indications that the near future holds equally radical changes in comparison with present standards. While the immediate effect may be to increase the number of customers supplied at a loss or without profit, ultimately the change will doubtless be as beneficial to the industry as to the public.

Standards of lighting are constantly being raised, and quite independently of illumination for light as it is generally understood, lamps are also used for signs, show windows and interior and general advertising. With the new lamps indirect lighting is coming rapidly into vogue, calling for a great deal more energy than the older methods, so much more that were it not for improved lamps the cost would continue prohibitive. In Mr. Williams' estimation, where light is used for industrial and business purposes, lamp efficiencies may go on improving indefinitely without seriously affecting, at least permanently, the income of the service companies. However, unless other sources of revenue are devised, or other than prevailing methods of charging for electric service are adopted, lamp improvements may have a serious effect upon the income of the industry from home service. The electric iron, the vacuum cleaner, the washing machine and artificial refrigeration are perhaps the four most important features of available household service, and Mr. Williams showed what this apparatus can be made to mean in the sense of income. Another great income possibility pointed out by Mr. Williams is the almost unbelievable service values that can be obtained from trackless haulage throughout the entire country.

Speaking on the subject of public relations, Mr. Williams said that in his opinion the greatest responsibility resting upon the management of public utility corporations is to hold the respect, good-will and warm friendship of the communities in which they render service, such as are now entertained for a large part of the membership of the association. Anything which invites or permits the opposite of these conditions to exist, thus creating fertile soil for political and social agitators or tending to further hostility toward public service corporations, seems, in the light of present-day conditions, practically inexcusable.

Meter Committee Report

Mr. S. G. Rhodes, New York Edison Company, chairman of the meter committee, submitted detailed results of laboratory investigations or actual service data, or both, for three types of direct-current meters materially cheaper both in original cost and maintenance than the present type of watt-hour meter. The meters are of the mercury type, which are practically free from the effects of stray currents and more desirable because of this than the present commutator type of watt-hour meter. The committee feels that the meter merits a careful investigation on the part of member companies as a pioneer cheaper meter which gives promise of very satisfactory performance. A German make of ampere-hour meter and an electrolytic ampere-hour meter were described as being sufficiently satisfactory to justify giving them serious consideration for use where low meter investment and maintenance must be obtained.

There is a tendency on the part of public-service commissions to look with disfavor on the use of the ampere-hour meter as a general type, but the meter committee urged member companies to assume a strong position in defense of the ampere-hour meter as a proper consumer's meter when it fulfils all the other requirements of good meter practice. Various forms of induction meters, maximum-demand meters, indicating and graphic instruments were also given attention.

Industrial Uses of Electric Heat

No recent developments in the domestic heating field warrant another report covering that branch of electric-heating work at this time, according to the report of the committee on heating, of which Mr. E. W. Lloyd, Commonwealth Edison Company, Chicago, is chairman. The report was therefore devoted to giving an account of what has been done by member companies in the industrial heating field.

From the evidence submitted it appears that the increase in such applications is going on at a very rapid rate, and with a little stimulation will pay big returns. Complaint was made that the larger cooking utensils for restaurants and hotels are not being pushed to the extent that the apparatus warrants. Speaking of the application of electric-

ity to furnaces, the committee points out that in plants manufacturing large quantities of steel for purposes requiring high-grade open-hearth or low-grade crucible metal, the Heroult furnace is best adapted, inasmuch as it may be operated on three-phase circuits without serious difficulty in phase regulation.

Report of the Lamp Committee

The first part of the report of the lamp committee, of which Mr. J. W. Lieb, Jr., New York Edison Company, is chairman, was taken up with a consideration of the details of the tests made by the Electrical Testing Laboratories of the lamps as supplied by the manufacturers to the member companies of the Edison association. It gave consideration to such matters as lamp-manufacturing facilities, reserves of lamp stock, the relative demands for the several sizes and types of lamps as compared with the corresponding demands of previous years, etc.

The report touched upon the radical change which the introduction of drawn-wire tungsten filaments has made in the state of the art, resulting in a more robust lamp and also in improved manufacturing methods. It has been found practicable to draw the wire to such a uniform standard that lamps can be manufactured to exact voltage as required. This raises the very interesting question of the possibility of the adoption of a general uniform standard voltage for all central-station lamps, and considerable time was given to a discussion of the various phases of this subject. It was pointed out that as the use of carbon lamps became less and less attention to the refinements of production was concentrated on the types of lamps more generally used. The report referred to the very rapid improvement in the performance of tungsten lamps, from the 250-watt unit up. These at the time of their introduction in 1911 consumed 1.13 watts per candle, with a useful life of about 685 hours, but with the improvements that have since been introduced they now operate at 1 watt per candle and have a useful life of nearly 2500 hours.

No extensive tests have been made during the year on foreign lamps, but such data as are available indicate that the American product is equal to the best European product, and the rating of American lamps is, on the whole, closer to the standard than are lamps of foreign manufacture. With the reduction in lamp prices by the manufacturers which went into effect on July 1 and with the great improvement made in tungsten lamps, it has been found possible to put some of the larger sizes of tungsten lamps on a free-renewal basis. This subject has already been covered in these pages.

The practice as to lamp renewals by the larger companies was next presented in some detail, indicating the types of tungsten lamps which are now being furnished on a free-renewal basis and the extra cost at which the standard sizes are being supplied where the customer's contract includes free renewals. As an appendix to the lamp committee's report, a printed pamphlet was presented giving details of lamp practice covering free renewals, deliveries to customers, identification of lamps, operating voltages, etc., for the various companies in the Edison association.

Exhibition of "Half-Watt" Tungsten Lamps

Much interest was manifested in the announcement made recently of the development of a "half-watt" tungsten lamp. The new lamps are filled with nitrogen gas, and a number of the lamps, the first that have been exhibited publicly, were shown. They ranged from 500 cp to 5000 cp, the latter a splendid sunburst—being the largest incandescent lamp ever produced.

Discussion followed concerning these powerful and efficient units with specific consumptions ranging from 0.75 watt per candle-power in the smaller sizes, such as 500 cp, to 0.5 watt per candle-power in the largest size, 5000 cp, raising the question of the place which these illuminants will occupy in the field of street illumination as compared with the prevailing types of arc lamps. Comparative data were presented of the efficiencies of modern arc lamps, and an extended discussion followed, in which Dr. C. P. Steinmetz, Mr. John W. Howell and others participated. In this discussion free scope was given to the imagination as to the possibilities in the development of higher efficiency types of large arc lamps.

Mr. J. W. Lieb, Jr., dealt at some length with the subject of arc-lamp carbons and the lines of development which are being followed to produce a steady white light of high efficiency and without the production of ashes which tend to obscure the light. The report closed with a reference to the various types of arc lamps on exhibition illuminating the grounds of the hotel.

Co-operation for Electrical Development

Co-operation for the benefit of the consumer as well as the manufacturer was the keynote of a meeting of prominent men interested in the development of electrical business held at Association Island, Lake Ontario, Sept. 3 to 6, under the chairmanship of Mr. Joseph B. McCall, president of the National Electric Light Association. Of the several noteworthy addresses presented, perhaps the one that most accurately characterized the meeting as a whole was delivered by Dr. C. P. Steinmetz in discussing the elimination of competition. Dr. Steinmetz claimed that competition is dead as an industrial and economic force and that co-operation has taken its place. He said that on the day when engineering increased the means of production of a commodity beyond the amount that could be consumed under existing conditions competition ceased to be a progressive driving force and became a destructive force. The masses of people imagine that industrial consolidation is killing competition, while in reality the death of competition as a beneficent industrial force is the cause of consolidation. With the arrival of co-operation in industry, with the consolidation into giant corporations, must come also control by commissions, at least temporarily until the forces have adjusted themselves.

The opening address was delivered by Mr. Samuel Insull, president of the Commonwealth Edison Company, Chicago, Ill., his subject being "Distribution of Electric Energy, Present and Future."

Distribution of Electrical Energy

Mr. Insull remarked that the problem of transmission of energy is perhaps of more importance than transportation. Before the widespread utilization of electrical transmission factories were located at the small water-powers. Many of these factories have been abandoned and the water-power is used for generating electrical energy for transmission. Electrical energy transmission has also expanded from another source, namely, steam. In the early days of electrical energy production, when steam was the source of energy, electricity was utilized largely for light, motor service being a by-product. To-day the conditions are reversed, and in many of the large systems electric light is a by-product and motor service is the chief source of income.

The return on the investment of central-station equipment depends largely on the motor-service business. In the cities of this country the lighting load represents from 27 per cent to 45 per cent of the total energy utilized. Mr. Insull expressed the opinion that the central station should produce energy for all transportation and industrial purposes as well as for lighting. The production and distribution of energy for all purposes should be under the control of one organization, even if it must become a public rather than a private enterprise.

The economies brought about by the concentration of production and distribution of electrical energy can be at-

tributed to the development of large turbo-generators, transformers and rotary converters. Mr. Insull cited the example of the Harrison Street station in Chicago, which is no longer a real factor in the production of energy throughout the Chicago territory. Although it cost from $1,500,000 to $2,000,000, it can carry a load equal to only about one-half of that which can be carried by one of the largest modern generators.

Energy can now be produced in a large station so economically and at such low cost that it can be distributed more economically that it can be produced locally. On account of the low load-factor the lighting load represents the poorest business a central station can obtain. However, it must supply energy for lighting as an obligation to the public rather than from the point of view of income. Taken in connection with the motor load it can be handled profitably, but it is a very poor load when considered alone.

Mr. Insull reported some interesting figures on the central-station situation in Great Britain as compared with that in the Chicago territory. Three hundred and three of the largest towns in Great Britain, having a combined population of 24,250,000 inhabitants, utilize stations having a combined rating of 961,000 kw, as compared with 264,000 kw in Chicago with its population of 2,285,000. The investment in central-station equipment in Great Britain represents about $310,000,000, as compared with $68,000,000 in Chicago, while the income in Great Britain is $40,000,000 per annum, as compared with $15,000,000 per annum in Chicago. In Great Britain the total energy sold equals 1,128,000,000 kw-hr., as compared with 712,000,000 kw-hr. in Chicago. The central-station investment per capita is $12.78 in Great Britain as compared with $31.24. The income per capita in Great Britain is $1.67, as compared with $7.03 in Chicago.

Contrary to the usual assumption that the prices in Great Britain are less than in America, the charges for energy in Great Britain exceed those in Chicago by from 70 to 80 per cent. The better showing in Chicago was attributed by Mr. Insull to the greater load-factor, namely, 42 per cent, as compared with about 25 per cent in Great Britain.

Under ordinary conditions the load-factor on central stations would be about 30 per cent. If industrial and motor service conditions are good, the load-factor may reach 45 per cent, thereby implying a 50 per cent increase in output from the same generating and distributing equipment. The most serious obstacle to concentration of generation of electrical energy is the prejudice on the part of engineers of isolated-plant owners, as well as the self-interest of the consulting engineer in advising his financial backers.

Concerning the future of energy distribution, Mr. Insull remarked that agitation with reference to the conservation of fuel will force the concentration of production of electrical energy. The concentration movement will also be forwarded by the limitations in finance, the trouble in financing small systems being much larger than that in combined large systems. Just as the country has found it desirable to combine its railroads into great trunk-line systems, so it will be found desirable to consolidate electrical transmission systems into networks supplying energy for all purposes. Concentration or production represents the solution of our great industrial problems in that it means low cost of production, low cost of transmission and a minimum selling price to the community.

Discussion

Dr. C. P. Steinmetz expressed his disagreement with Mr. Insull concerning the increase in the size of generating units, transformers and rotary converters. This increase has been due to the demand for large units created by the concentration of electrical energy production, such as has been brought about by Mr. Insull, and is not the cause for the concentration, as Mr. Insull intimated.

Government in Relation to Business

State Senator Willard Howland, of Massachusetts, outlined the attitude of the government toward the industries with special reference to public utilities. Regulation which was once considered undesirable is now required. This result is attributable to developments that have rendered former luxuries present necessities. It is the belief on the part of the public that electric service should no longer be classed as a luxury that accounts for the attitude toward electric service companies. The remedy to be applied by the companies involves a recognition of this change in condition and an effort to treat electric service as a necessity.

With good service maintained at a price to produce a fair return on the investment, the service companies have nothing to fear from either public ownership or commission regulation. Regulation is essential to securing proper remuneration for both capital and labor. Senator Howland maintained that the attitude of the government toward industries is such as to protect and develop rather than destroy them.

Discussion

Dr. Thomas Darlington, New York, remarked that instead of criticising governmental officials everyone should take an active constructive interest in governmental affairs and assist the officials in solving the difficult problems presented to them.

Electrical Development

In his lecture on the future technical development in the electrical business, Dr. C. P. Steinmetz remarked that the limit in size of steam turbines and turbo-generator apparatus has not yet been reached, and that units reaching much more than 30,000 hp will be built when a demand arises for such equipments. Although transmission systems have covered distances greater than 200 miles and areas as large as 20,000 sq. miles and are operating at electromotive forces as high as 150,000 volts, the limit has not been reached in either length of circuit, transmission area covered or voltage utilized.

Application has been made of the electric motor in transportation only for local work, there being as yet no long-distance railways operated electrically. However, local electric railway service has been developed to such an extent that these railways consume at present more power than would be required for operating all of the steam trains electrically. The development of local electric railway service has brought about a revolution not only in domestic life but also in industrial activity. Factories can now be located at the most economical sites from the point of view of operation and the workmen can select sites for their homes within a wide radius, from the point of view of convenience in domestic arrangements and comfort.

As compared with other forms of energy electricity is superior in three important characteristics relating to transmission, conversion and concentration. Electrical energy can be produced most economically at one place and transmitted efficiently to be utilized just when and where wanted without regard to the location of the source of supply of coal or water. Chemical energy can also be transmitted in the form of fuel, but not so economically as can electrical energy. Electrical energy can readily be converted into other forms, while fuel can produce only heat, usually at a low efficiency. The concentration feature of electrical energy is highly advantageous in many industrial applications, such as the separation of iron and aluminum from their ores, the production of calcium carbide and the recovery of nitrogen from air.

One of the prominent disadvantages of electrical energy resides in the fact that it cannot be stored but must be used as produced. The so-called electrical storage battery stores energy chemically. It can be used for short-time storage for a limited amount of energy, but is uneconomical when considered in connection with such problems as the sea-

sonal storage to assist in carrying the load on a hydroelectric station during the low-water period.

On account of the non-storage feature of electrical energy the load-factor is an important element in connection with the operation of an electricity supply system. The electricity must be produced in each instance just as utilized, and hence the cost of equipment for producing a certain amount of energy is a minimum while the load-factor is a maximum.

Recent developments in steam-turbine plants have shown that the larger the unit the less the specific steam consumption. This relation seems to hold true without limit so far as present knowledge goes. Considerable economies can be effected by combining small systems into larger ones and making use of prime movers and generating units of larger size. With the concentration of production from isolated systems to a single interconnected system, a serious problem is encountered in the possibility for destruction. This problem has been solved in the case of the Chicago system by means of reactance coils.

With reference to the utilization of electrical energy, one need not to-day discuss the possibilities but should consider merely the economical features. The question is not whether such and such a thing can be done electrically, but whether it can be done electrically more economically than by some other method. In many cases, such as the substitution of electricity for steam, marked economies can be obtained by revising the system to meet changes in the conditions brought about by the utilization of electricity. The problem involves reorganization to accommodate electrical service. For example, when electricity is substituted for steam for transportation, the electrical trains need not be duplicates of the steam trains. Better results could be obtained by utilizing a larger number of trains of shorter length. This change represents an improvement not only in service to the public but also in the load on the system.

In many cases it would be advantageous if industrial installations were so operated as to avoid the use of electricity during the lighting load period. It would be possible in some cases so to reorganize the service in certain industries as to use a little electricity during the low-water period on the hydroelectric installation. Arrangements of this kind mean co-operation in its highest and best sense.

State Commission Control

Mr. John H. Roemer, chairman of the Railroad Commission of Wisconsin, discussed in a convincing manner the present attitude of the commissions toward the public service companies and explained the various rulings made by the Wisconsin commission. An abstract of this address is given on page 531 of this issue.

Discussion

Mr. Henry L. Doherty, New York, remarked that the Wisconsin commission has been a pioneer in the regulation of public utilities and has blazed the way for commissions subsequently formed. In many respects it has been liberal, but not liberal enough. The commission has not properly appreciated the trouble encountered in attempting to obtain the necessary capital for electrical development. The commissions are taking it upon themselves not only to regulate utilities but to assist in developing the country through the utilities. Mr. Doherty expressed the opinion that it is not proper to specify permissible capitalization on the basis of the cost. As a matter of fact the properties may be worth either more or less than the actual cost and should be capitalized at their value without reference to cost. Mr. Doherty claimed that an effort should be made to educate the public on all utility questions in order to remove any existing prejudices against the utilities.

Financiers and Utility Securities

Mr. Frank A. Vanderlip, president of the National City Bank, New York, pointed out that for the normal needs of electrical development $2,000,000,000 of new capital will be required in America during the next five years. He argued that the securities of public service corporations are sounder and more secure, on the whole, because of the tendency to place the affairs of these corporations under commissions, and stated that financiers now look with much favor upon the investments in public utility securities. Mr. Vanderlip's address appears in full elsewhere in this issue.

Discussion

Mr. Henry L. Doherty, New York, confirmed the figures presented by Mr. Vanderlip, and stated that according to his own estimates at least $300,000,000 is needed in new electrical work during the present year. He stated that the rental value of capital has increased enormously during recent years, but the electrical interests are better able to obtain capital needed on account of rapid developments in electrical applications. Statistics show that the average American city has increased in size about 100 per cent in twenty years. On this account predictions as to service which electrical utilities can render are practically always well within the results obtained. The result is most frequently that the bond issues initially made are too small. Mr. Doherty claimed that under present conditions and with future prospects the ideal investment is one in electrical securities.

Resale Price-Fixing

Mr. F. D. Fish, Boston, discussed the principle of resale control, stating that the subject is closely related to the trend of the times. The present hostility to the control of the resale price is a part of the general reaction from the older method of encouraging industrial progress. For example, some years ago much encouragement was offered to the builders of railroads in order to afford transportation facilities for developing the country. The laws passed at that time were liberal and well suited to the conditions then existing. As a result of the developments brought about by legislation which encouraged industrial progress, the past fifty years has witnessed the greatest progress in history, especially in this country. Intellectual activity has reached a plane never before attained. The best minds of the country have been devoted to industrial development and to the sciences associated therewith.

In the reaction that is now taking place certain evils formerly overlooked are now being noticed and magnified. In fact, the public as a whole may be considered to be unreasonable in its demand upon the persons now associated with industrial development. A portion of the change in public sentiment can be attributed to certain accidents of opportunity to a few individuals, who have accumulated enormous wealth and thereby acquired the hostility of poorer men.

The present tendency is to make laws to protect the individual small consumer at the expense of the larger and more powerful consumer. This plan is excellent if not carried too far. However, it is incorrect to assume that national prosperity is bound up with the cheapness of articles to the individual consumer. The great danger at present lies in the over-accentuation of the desirability of cheapness.

In former times competition was looked upon as the life of trade, but under present conditions it can well be considered the destruction of trade. It needs no argument to show that the more goods there are manufactured the cheaper the price per unit. Under present conditions the method which has proved most satisfactory is that involving large sales at small profits. It is this method which proves most highly satisfactory with such staple articles as can be looked upon as necessities.

In the case of special articles for which one must create a market, manufacturers have found it extremely desirable to establish a fixed price at which each article will be sold to the ultimate consumer. This method is essential for the

stability of the business created by the advertising and marketing of the special article. For instance, if a consumer discovers that some well-advertised article can be purchased at a low price in one neighborhood while it is being sold at a higher price in his own town he refuses to purchase from the local dealer, although he may or may not purchase from the dealer offering to sell at a lower price. In this way the business becomes demoralized and the reaction proves undesirable from all points of view.

The courts have held that an inventor can set the price at which his patented article will be sold but not the price at which it will be resold, his interest in the article ending with the first sale, from which he receives his compensation. A legally sanctioned method by which unpatented articles may be sold to the ultimate consumer at a fixed price is that involving the establishment of stores or agencies throughout the country for the distribution of the articles.

Although the courts have held that neither the manufacturer nor the inventor can specify the resale price of articles, yet Mr. Fish contended that their attitude is illogical and that the fixing of the resale price should be legalized in the case of special articles that cannot be considered luxuries. In many cases the compensation for the inventor is closely associated with the establishment of a fixed resale price, and unless the inventor is allowed to specify a uniform price at which the article will be sold he fails to obtain adequate return for his invention.

Discussion

Reference has already been made to comments by Dr. C. P. Steinmetz relative to the substitution of co-operation for competition in modern industrial activity. Dr. Steinmetz claimed that the fixing of a resale price in reality represents the elimination of competition between the jobbers and the retailers, and the opposition against it in the public opinion is the same as the opposition against eliminating competition which is the foundation of the opposition against the corporation. In the public mind competition is still the foundation and the driving force of our industrial progress. They have not yet realized that competition is dead as an industrial and economic force.

The idea of competition as a benevolent force in industrial progress was based upon the theory that by competition between the producers prices would be lowered just as much above the cost of production as is necessary to give a fair profit. But the fallacy involved in this reasoning is the neglect of the economic law that it is financially more economical to operate a factory or an industry at a loss than it is to have it stand idle. The result is that unlimited competition, with the ability of producing beyond the demand, forces the prices down to where it would begin to be cheaper to stop production; that is, where the loss in production exceeds the loss in having the industry stand idle. The limitation of price forced by competition therefore is below the cost of production, and as the result the level reached by free competition is an unstable condition, a condition of production at a loss, which can exist and continue for a limited time only, but finally ends in receivership and the destruction of the industry.

The natural result of this industrial law has been that competition could not continue, but intelligent people in charge of the industries got together before the level of destruction was reached. This led to co-operation as the force which is taking the place of competition. All of the attempts to resurrect to life a dead issue by legal enactments, by trying to break up the corporations and forbidding the control of the resale price, are contrary to the economic law underlying present industrial production, and are therefore hopeless and are a failure. You may destroy the industries, but you cannot restore competition. It is dead. The people must be educated to understand that with our industrial conditions, with our enormously increased means of production, competition cannot exist without self-destruction, and co-operation must take its place.

Favorable Conditions for Labor

Dr. Thomas Darlington, secretary of the welfare committee of the Iron and Steel Institute, New York, delivered a highly interesting illustrated address showing the methods employed by many of the large corporations. He claimed that it is no longer necessary to place welfare work in the column of philanthropy, because it is found to represent a paying investment from a purely monetary point of view. He showed that when the conditions surrounding the workmen during both factory and home hours are conducive to health and happiness the company obtains a greatly improved result for the money expended in wages.

The Society for Electrical Development

Mr. J. Robert Crouse, vice-president of the Society for Electrical Development, showed in what way central stations, electrical manufacturers, jobbers, dealers and contractors can co-operate economically in the expenditure of money for business expansion. The data presented by him were given on page 169 of our issue dated July 26, 1913.

The working plans of the society were outlined by Mr. J. M. Wakeman, general manager of the society. He explained that the society is an outgrowth of the idea now taking hold that co-operation and not competition is the life of trade. The campaigns of this society will include the publishing of articles in popular magazines showing the proper applications of electricity. These articles will be written to appeal to the general public. In the trade press use will be made of articles prepared by men identified in each case with the industry which the paper represents. For example, articles relating to the use of electricity in paper mills will be prepared by men of reputation in the paper industry who have had experience in the use of electricity. Articles will be prepared for the daily newspapers in order to present the truth concerning electrical devices, public utilities and corporations. Among the features of the educational campaign will be the preparation and distribution of moving-picture films showing the advantages of electricity in the home, factory, etc. Arrangements have already been made for renting these films in various localities at the rate of $5 per day. Plans are being formulated for equipping with electrical devices a demonstration car which will travel from place to place in an educational campaign conducted by the Society for Electrical Development in co-operation with central stations in various localities. The society will be prepared to render assistance to small central stations in launching new-business campaigns. It will maintain a bureau of statistics for the collection and dissemination of knowledge concerning the various applications of electricity.

Mr. W. E. Robertson, as vice-president of the society, claimed that the time is now ripe for beginning the work the society is planning to undertake and that the results cannot fail to be successful provided only that the necessary money is obtained. On account of the fact that these plans have been indorsed by the best men in the electrical industry he predicted that the money will be quickly raised and the success of the society assured.

Mr. H. L. Doherty, president of the society, stated that the membership now exceeds 400, with subscriptions amounting to more than $135,000, only $65,000 now being needed to complete the initial amount of $200,000. The society has received the helpful co-operation of the Jovian Order, with its membership of 13,000. The Jovians are assisting in harmonizing the interests in the various localities and in presenting the advantageous features of membership in the Society for Electrical Development. Assistance is also being received through the co-operation of the

Commercial Section of the National Electric Light Association, and plans are being made to co-operate in the same way with committees of numerous societies.

The Co-operative Movement

Mr. Frank W. Smith, vice-president of the Electric Vehicle Association of America, outlined the co-operative advertising campaign conducted by this association. It obtained subscriptions of about $42,000, 11 per cent of which came from vehicle manufacturers, 31 per cent from manufacturers of accessories and 58 per cent from central stations. This campaign has proved successful and will be continued. New subscriptions already received amount to about $34,000.

Mr. Norman Macbeth, vice-president of the Illuminating Engineering Society, called attention to the co-operative methods employed by this society in disseminating knowledge concerning proper illuminating engineering practice. Committees of this society work in harmony with committees of a large number of other societies not only in compiling information on illumination but also in obtaining papers for presentation before sessions of one or the other of the two co-operating societies. For example, two of the sessions of the recent International Congress on School Hygiene were devoted to the subject of illumination, the Illuminating Engineering Society co-operating in these sessions. In connection with its educational campaign the Illuminating Engineering Society works through various committees, such as the committee on the illumination primer, the committee on public lectures, the committee on factory lighting and legislation, and the committee on collegiate education.

Mr. D. L. Gaskill, secretary of the Ohio Electric Light Association, promised the co-operation of his association in the work which the Society for Electrical Development is undertaking. He claimed that each society interested in the work of electrical development should devote at least one session throughout the year to the subject of co-operation.

Mr. S. O. Richardson, Jr., as president of the Manufacturers' Club, stated that this club had been organized to exchange ideas along the lines of manufacturing, patent laws, standardization of material and welfare work. The club is greatly in favor of co-operation along the lines advocated by the Society for Electrical Development. For the purpose of introducing a proper feeling on the part of the general public toward electrical matters he suggested that the educational campaign include information concerning the development of various electrical devices—for example, the tungsten lamp.

Mr. W. E. Robertson, on behalf of the Electrical Supply Jobbers' Association, stated that the jobbers are willing and anxious to co-operate with the contractors, central-station men and manufacturers in the work of developing the electrical business.

Mr. Ernest McCleary, of the National Electrical Contractors' Association, stated that the attitude of the contractors concerning the Society for Electrical Development is best shown by the fact that contractors represent a larger portion of the members of this society than does any other group of men in the electrical business.

Mr. F. E. Watts, Jupiter of the Jovian Order, stated that the order has been pleased to assist in raising subscriptions for the Society for Electrical Development, which it is able to do on account of the large number and wide distribution of its membership. During the month of February the Jovian Order added to its enrolment more members than it had obtained in the first eight years of its existence. Jovians are able to harmonize seemingly conflicting interests in each locality by means of luncheon meetings and can help in suggesting constructive rather than destructive legislation. They can do effective work, also, along the line of educating the public concerning utilities.

Objects and Benefits of the Society for Electrical Development

Mr. Stephen L. Coles, acting secretary-treasurer of the Society for Electrical Development, in discussing the field for activity of that society, stated that the electrical industry has reached its present tremendous volume and vital importance in the world's economics largely through co-operative efforts in various specialized directions. Each important division of the electrical industry has its own association, working intelligently and successfully for its members along certain lines of peculiar benefit to them.

There is at present but one general organization in the field whose membership is open to both technical and commercial men. That is the Jovian Order, composed of 12,000 individuals, allied in various capacities with the electrical industry. This order stands as a glowing example of true individual co-operation, which is fully expressed in its slogan, "All together, all the time, for everything electrical."

Until the formation of the Society for Electrical Development there was no non-technical association whose membership was open to companies and corporations doing business in all branches of the electrical field. Every organization heretofore formed by electrical men has been designed to benefit them inside their own particular class of work.

The ultimate consumer of the goods and service produced by the best engineering and inventive skill and the most highly developed manufacturing processes the world has known has been to a great extent ignored. All electrical development heretofore has been largely selfish, and the public, upon whose support the whole industry is dependent, has never been taken seriously into close affiliation. In other words, the real vital element of a great problem has been overlooked, while detail development has received minute and careful attention.

The electrical field has gone on indomitably, perfecting principles here, refining complications there, and generally progressing at a marvelous rate; and all the time, with one or two exceptions, no one thought it worth while to try to educate the public in the use of new devices, in the adaptation of the latest discoveries to special needs, or in demonstrating the value of full electric service in home and factory. Here exists an excellent opening for establishing not only co-operation among the several divisions of a great industry but real co-operation between that whole industry and the public at large, upon whom the industry is dependent for its full success.

A few years ago this great opportunity for double service was appreciated and grasped by Mr. J. Robert Crouse, who attracted to his standard a number of other equally enthusiastic pioneers with an understanding of the true meaning of co-operation. The embryonic idea gradually took form, and after the usual vicissitudes incident to acquiring momentum experienced by every forward movement, has emerged as an entity certain to occupy a large place in the public mind and in the business policies of the electrical industry.

The Society for Electrical Development is here, and here to stay, and to grow in value and in service. It has the best reason possible for existence, its field of effort is almost limitless, it is founded on correct co-operative principles, its form of government is truly representative and absolutely equitable, its requirements for financial support are extremely modest in comparison with the volume of business taxable, and the returns are sure and in true proportion to the effort the society is enabled to put forth.

The society has only one object—"to promote and increase the use, by the public, of electric energy for all useful purposes as an end in itself and as a means for increasing the demand for apparatus and supplies."

Where every effort of a thoroughly representative and perfectly balanced organization is concentrated on only one object, it follows logically that the results to its mem-

bers will be greater and more cumulative in effect than when several objects are sought, causing a scattering of effort and usually a waste of energy.

The society is a money-spending organization and can, under no circumstances, become a money-making scheme. Its board of directors receives no remuneration and pays its own expenses. The only salaried officials are the general manager and the secretary-treasurer, who report to the executive committee, which is appointed from the board of directors, who hold office through the votes of the membership. The vote of the small member is exactly equal to that of the largest company in the society.

Outside of the two salaries mentioned and those of the necessary office force, the entire income of the society will be used in the various campaigns and in the furtherance of the several plans which have been approved by the board of directors as best suited to accomplish the one object of the society.

In five months the society has received 412 applications for membership from manufacturers, central stations, jobbers and contractors, covering pledges for subscriptions approximating $140,000. The society wisely has decided not to begin its work until $200,000 has been pledged. Active campaigns are now being conducted to procure this amount as quickly as possible.

Electrical Development Society Membership Campaign

At a meeting of the membership campaign committee of the Society of Electrical Development held at Association Island on Saturday, Sept. 6, it was decided to continue the present campaign for increasing the membership along the lines already laid down. Valuable assistance is being received from the Jovian Order. The society will engage a man to help in the work now being done by the Jovian statesmen. The salesmen of the member companies will be asked to co-operate in the new membership work. For the purpose of advertising the society among electrical men signs bearing the name of the society and its slogan will be prepared for distribution among the member companies, which will be requested to display them conspicuously in their offices and, in the case of jobber and supply dealers, in their show windows. The last week in October has been designated as the "Society for Electrical Development Week," and during it everyone engaged in the electrical industry will be asked to co-operate in obtaining members for this society. It is expected that the minimum amount of $200,000 will be pledged by the end of October and that the active work of the Society for Electrical Development will commence during November.

The International Photometrical Commission

The fourth meeting of the International Photometrical Commission was held on Aug. 27 and 28 in admirable quarters at the Reichanstalt, Berlin, Germany, placed at the disposal of the commission by Professor Warburg and made ready by the assiduous courtesy of Dr. Brodhun. The delegates from the several countries participating included a large proportion of the names familiar in the art. The American delegates were Messrs. Louis Bell, E. P. Hyde, A. E. Kennelly, C. O. Mailloux, P. S. Millar and C. H. Sharp.

President Vautier delivered an appropriate address setting forth the circumstances which had led to this remarkable gathering and the nature of the work before it. He stated that the International Commission of Photometry was founded by the International Congress of the Gas Industry in Paris on the occasion of the Universal Exhibition of 1900. All the nine countries having technical societies which represent the gas industry took part in that congress. The aim of the congress was to study the rules which should be applied in photometry of incandescence by gas and consequently to organize investigations which might lead to a better knowledge of the complicated mechanism of illumination of incandescence and to an improvement in its realization. The commission decided in 1911 to ask the electrotechnical committees of the nine countries which had joined its organization to send delegates who would take part in the study of all questions of common interest. In the spring of 1912 the American Gas Institute wrote to the International Commission of Photometry: "The best and most permanent results will be obtained if the method inaugurated by this commission [in its resolution to invite the representatives of the National Electrotechnical Committees] should be enlarged in such a way that the International Commission of Photometry could represent completely all the interests of illumination on an even footing and under reciprocally acceptable conditions, involving the illuminating engineering societies of America and Great Britain, besides the national laboratories and the technical societies dealing with gas, electricity, acetylene and other illuminants. If the commission should not think it opportune to enlarge itself in such a way, and prefers to remain exclusively a gas commission, it would still be advisable for it to take the initiative of sending an appeal to all principal societies interested in photometry, and to ask them to participate in the formation of an international commission which would treat all questions of nomenclature and units used in photometry. On choosing the first alternative the International Commission of Photometry would be responsible to all photometric interests represented in the commission; it would become an international commission of illumination."

The American Gas Institute had suggested that the work of elaborating a project of statutes should be given to a sub-committee consisting of the representatives of the national laboratories of Germany, England, America, Austria and France. This committee would assure impartiality. In consequence, Messrs. Brodhun, Paterson, Kosminsky, Rosa and Laporte were asked if they would help. Mr. Paterson was kind enough to accept the position of secretary and to present a first scheme, which was sent to all members of the sub-committee. They sent it back with their notes. This document, together with comments, was sent to all technical gas societies adhering to the commission, so that they might follow the proceedings. Mr. Paterson tried afterwards to harmonize as well as possible the various proposals of his colleagues and edited a second scheme, which was sent, first in French, and afterwards in English, German and French, to all the gas and electrical societies of the nine countries adhering to the commission.

The technical societies representing illumination by gas or electricity in the nine countries were asked to participate in the projected meeting. The Germans agreed on being represented through the Deutsche Beleuchtungstechnische Gesellschaft. Those of the United States formed a national committee which appointed its delegates, and the same was true in England. In the other countries the technical societies of illumination by gas and electricity appointed their own delegates.

President Vautier called attention to the importance of adopting a plan of government which should be as broad as possible, in order to permit the societies of the different countries to evolve their own organizations to suit their own purposes. The particular feature of the new commission will be that it will group for common work the representatives of industries who possess totally different means of production and who are themselves in competition in commercial matters.

The sub-committee had first thought the organization of the Electrotechnical International Society could be taken up. This commission has imposed on its adherents the

formation of a national electrotechnical committee for each country. This formation is certainly logical, because these committees, just like the Electrotechnical Commission itself, represent the interests of only one industry. Whether the national committees on illumination will be constituted as easily and will be able to act with such usefulness will depend to a great extent on those who are appointed, and also on the kind of problems they will attempt to solve, those of purely commercial interest being excluded. They certainly can be useful. It is easy to understand that the wishes and opinions they express, being based on an agreement of different industries, will secure impartiality much better than the opinions of a single industry would do. At all events, the interest with which certain countries formed or decided to form national committees shows that the idea was welcomed, especially in the United States, England, Germany and Austria.

At the close of the president's address consideration was given to the proposed statutes prepared in advance by the sub-committee charged with the important work of formulating the reorganization of the International Photometrical Commission into a body undertaking the larger responsibilities of dealing with the general problems of illumination. Progress was slow owing to the necessity of working in three languages, and the difficulties thus imposed loomed large in dealing with the exact phrasing necessary in the governing statutes. The lack of precise equivalents in various languages was much in evidence.

After much discussion and translation, substantial progress was made. An editing committee, consisting of Dr. Kruss, Mr. Mailloux and Mr. Monod, was appointed to reconcile differences of language in the final draft, and the sections of the statutes dealing with the name and purposes of the new organization gradually took form to be brought into final shape, like the rest of the statutes, by discussion in the sub-committee which had originally formulated them. It was then provided that all suggestions and emendations should be reduced in writing and presented with suitable briefs to this sub-committee, a procedure which will facilitate further action. Everyone who spoke seemed animated by a sincere desire to organize the enlarged commission on a broad, scientific basis, and the outlook is exceedingly good for results of great and permanent value.

The important third section of the statutes, dealing with the constitution of the national delegations, was then reached, and Mr. Mailloux presented for consideration some important modifications of the original scheme, intended to give a larger measure of flexibility in the selection of the national delegates. These proposals were deferred, to be reduced to written form for distribution among the members.

The sub-committee consists of Messrs. Brodhun, Kusminsky, Laporte, Paterson, Kennelly and Vautier, with various collaborators called in for advice and assistance.

During the second day's proceedings most of the statutes were disposed of with merely the usual amount of verbal quibbling and slight emendations, but two matters took on from the start a somewhat grave aspect. The first of these was that of representation. In the ordinary case a national committee could be readily formed by the concurrent action of the chief technical societies, and this in fact was done in the majority of cases. But a question arose as to the representation of countries in which there might chance to be internal dissension so that either no national committee could be formed, or if one were constituted, it might be far from representative even with the best of intentions. The original form of the statutes contained some elaborate provisions to meet such cases, which, however, would also tend to perpetuate existing disagreements and hinder the later expansion of representation. Strife waxed hot on the matter, which was finally left over night to the editing committee and the private consideration of the delegates in the hope that a way out of the trouble might be found.

The second troublesome matter was that of the formation of working sections of the international body. A certain part of the delegates showed a determination to split the commission into autonomous sections with restricted membership and merely subject to the main body in the case of passing resolutions of strictly international significance. This was opposed by others, who held that while for efficient work there must be committees in continuous action on special topics, no division of the membership must be permitted. Two propositions, brought forward by the British and American delegates respectively, were finally turned over to the editing committee for recasting into one in which sub-committees were authorized, but with the provisions that they must be under the full control of the general body and that any sectional meetings held as a matter of convenience must be absolutely open.

By Saturday morning the very serious complication over methods of representation was settled by a proposal of the French delegates, who were really the ones most involved in the affair. This done, the other matter, regarding the powers and functions of subordinate groups, came up. Having been put into a form which met all valid objections, this was promptly ratified. Much of the remaining time was taken up by a discussion of quorum, voting by proxy and such matters, which finally were put into acceptable shape. The statutes came up for ratification and acceptance as a whole, and at 6 p. m. on Aug. 30 the final vote was passed unanimously and the International Commission on Illumination became a duly constituted body.

Its first act was the election of officers, and amid great applause M. Vautier, France, was unanimously elected president on the nomination of Dr. Duddell, first by acclamation and then by a formal vote of nations. The three vice-presidents were then balloted for, this resulting in the election of Prof. Bunte, Germany, Dr. Hyde, America, and Dr. Kusminsky, Austria. For honorary secretary, Mr. Paterson, England, was chosen, and for treasurer, Mr. Weiss, Switzerland.

A temporary sketch of a budget was made so as to permit Mr. Paterson to organize his office, and on the invitation extended by M. Masse, of the French delegation, Paris was agreed upon as the next meeting place. The session ended with a most happy address of felicitation on behalf of the delegates by Mr. Mailloux and a cordial response by President Vautier.

The organization as finally worked out is not a complicated one. It has a president, three vice-presidents, a secretary and a treasurer as the officers, who, with two representatives from each contributing country, form the executive committee. This committee has practically plenary authority in the general affairs of the commission. The representatives of each country are selected by its national committee if there is one, which has the power, if it desires, to allow important societies to send delegates directly representing them. In default of a national committee, societies interested may act directly, but in no case may more than ten delegates be sent by one country. The deliberations may be either in English, in French or in German, each language when used being promptly translated into the others. Likewise papers may be in any of these three languages. In the reporting of meetings and the proceedings in general, French is taken as the basic language so as to have a single verbal standard from which translations into the other tongues may conveniently be made. The wisdom of this single standard was amply shown in the discussion of the details of the statutes, in which there were all sorts of trouble due to the slight variation in meaning of nearly equivalent words.

The president has been authorized to reappoint the existing committees of the now superseded Photometric Commission with such additions as he may deem wise, pending the starting of the new organization, so that work in progress may continue without interruption.

Knight Templar Decorations at Denver

One of the most elaborate and artistic installations of decorative lighting ever undertaken in an American city was that which marked the thirty-second triennial conclave of the Knights Templar in Denver during the month of August. Preliminary work on these illuminating effects was begun over a year ago under the direction of Mr. W. J. Barker, general superintendent of the Denver Gas & Electric Light Company, who was chairman of the illuminating committee of the Knights Templar. He was assisted by Mr. George E. Williamson, illuminating engineer.

The central feature of the lighting was the Court of Honor on Champa Street, extending from Fourteenth to Eighteenth Street. Twelve columns showing electrical fountain effects were erected in each block, and lamps totaling 1000 cp were used in each column. The bases of the columns were composed of art glass, and on these were placed octagonal glass prisms surmounted by knights' helmets and plumes. Sprays of water were continually playing inside the glass cylinders, and several handsome color effects were worked out. Steam was also made to issue from lighted Holophane reflectors on the tops of the columns, giving the effect of incense rising from the entire Court of Honor. Twenty-four different conbinations of color were secured by the use of various kinds of glass in combination with reflectors. There were six large tungsten units in each column, four being 100-watt lamps, one a 500-watt lamp and one a 250-watt lamp. The columns were connected together at their bases by lighting conduit and by the pipes for the steam and water. These conduits were laid along the sidewalk close to the curb and were protected with boards. Rope covered with silver tinsel was stretched from column to column, giving a complete connected effect to the whole scheme of illumination used on this street.

Fourteenth Street had thirty-three stringers developing an attractive red, white and blue color scheme. Seven thousand lamps were used in the illumination of this street. The Fifteenth Street illumination extended twelve blocks. Each of the stringers was composed of lighted stars with an illuminated Passion cross in the center. The lamps were set in a white background and the effect was heightened by the red globes and tinsel on each of the ninety-six arc lamps of the twelve blocks. A total of 3456 lamps was used on this street. Red Maltese crosses formed the center pieces of the stringers in the Sixteenth Street illumination,

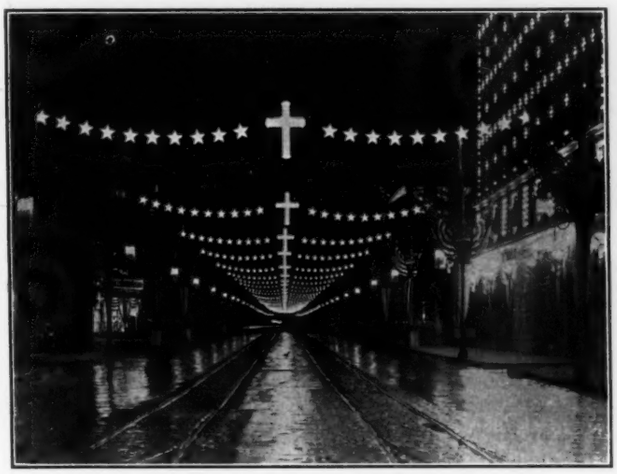


FIG. 1—FIFTEENTH STREET—STRINGERS OF STARS AND PASSION CROSSES

FIG. 3—FOURTEENTH STREET STREAMERS OF RED, WHITE AND BLUE LAMPS

FIG. 2—SOUTH END COURT OF HONOR, SHOWING ELECTRIC BUILDING

FIG. 4—CHAMPA STREET ILLUMINATION AND GIANT MOUNTED STATUE

which extended over eleven blocks. In each of the forty-seven castles surmounting the trolley poles there were four 16-cp lamps, which brought out the features of this beautiful decoration.

Seventeenth Street had a striking novelty in its transparent shields representing the various commanderies. On one side of each shield was the commandery seal and on the other a photograph of the grand commander of the state designated. On Curtis Street the lighting was in the shape of rope effects extending between the trolley poles on both sides of the street. At intervals there were hung thirty-two Passion crosses and sixteen Maltese crosses, each illuminated by two lamps.

The sign of the seal of the Colorado Grand Commandery at Colfax Street and Broadway was a most striking piece of illumination and was much praised by the 35,000 visitors. Its dimensions were 36 ft. by 54 ft. The "C" in the sign was 36 ft. in diameter and the surface of the display was studded with 2260 lamps with amber, blue, frosted and red globes. The animated Maltese cross at Eighteenth and California Streets measured 48 ft. by 38 ft. There 1570 lamps were used—frosted, clear, opal, yellow, red, amber, green and purple. Each of the 100 stars on the top and bottom borders was jeweled with a single 4-cp lamp.

The north end of the Court of Honor on Champa Street was made highly spectacular by a giant horse mounted by an armored knight. The huge piece measured 48 ft. by 54 ft. over all and was lighted by two 100,000-cp General Electric search-lanterns on the roof of the Foster Building. A covering of glass flakes on the horse gave the illumination a beautiful sparkling effect, and no feature of the rich trappings of gold and silver was missed in the powerful illumination of the big search-lamps.

The sunrise structure in front of the entrance of the Auditorium contained 2500 4-cp lamps and 150 250-watt tungsten units in frosted-bowl and D'Olier steel-helmet reflectors. Ten thousand yards of colored tinsel were used.

The lighting of the big temporary grand stand was also a considerable task, as this large arena where the Templars passed in review had a seating capacity of 26,400. Circled around the arena were twenty-four magnetite-arc lamps, and stretched from the center were thirty multiple-type Westinghouse 3000-cp flame-arc lamps. On the back of the stand were thirty-seven 60-cp series tungsten lamps.

The entire lighting for the conclave required 70,000 extra sockets, and approximately 6000 kw was the connected load for the extra illumination. The committee appropriated $40,000 for the illumination, and all the pieces were planned and manufactured in one of the large warehouses of the Denver Gas & Electric Light Company.

Meeting of the Kansas Public Utilities Association

The Kansas Gas, Water, Electric Light and Street Railway Association will hold its sixteenth annual convention at Hutchinson on Oct. 9, 10 and 11, at the Commercial Club rooms. The morning of Oct. 9 will be taken up with the registration of members. Following the address of the president, Mr. L. O. Ripley, Wichita, the following papers will be presented: "The Cost of Distribution Versus Cost of Production," by Mr. J. R. Murphy, manager of the Hoisington Electric & Ice Company; "The Relation of the Load-Factor to the Net Revenue of the Average Kansas Central Station," by Mr. F. F. Rossman, of the Westinghouse Electric & Manufacturing Company, Kansas City, Mo.; "Pumping Water for Municipalities," by Mr. M. Dunsworth, manager Emporia Railway & Light Company; "Treatment of Poles," by Mr. F. B. Uhrig, district manager Western Electric Company, Kansas City, Mo. In the evening Mr. P. Lloyd Lewis, of the Wagner Electric Manufacturing Company, Kansas City, Mo., will explain the work of the Jovian Order.

At the morning session on Oct. 10 the following papers will be presented: "Manufacture and Installation of Concrete Poles," by Mr. C. L. Brown, secretary of the River side Light & Power Company, Abilene; "Some Features in the Organization and Development of an Interurban Railroad," by Mr. Charles D. Bell, superintendent of the Arkansas Valley Interurban Railway, Wichita; "Some General Features Which All Public Utilities Have in Common," by Mr. A. M. Patten, assistant general manager Western Railways & Light Company, Topeka; "Small Central-Heating Plants," by Mr. H. C. Kimbrough, manager American District Steam Company, Chicago; "Intangible Values and Their Relation to the Valuation of Public Utilities," by Prof. George Shaad, Kansas University, Lawrence; "Special Street Illumination with Ornamental Concrete Posts," by Mr. F. A. Pielsticker, manager of the Eldorado Electric & Refrigeration Company, Eldorado, and a paper by Mr. L. M. Gazen, chief electrician Atchison, Topeka & Santa Fé Railway Company, Topeka, the subject of which will be announced later.

At the afternoon session papers will be presented as follows: "The Relation of Public Utilities to the Public," by the Hon. Henderson S. Martin, chairman of the Public Utilities Commission of the State of Kansas; "The Financing of Public Utilities," by Mr. H. P. Wright, president of the H. P. Wright Investment Company, Kansas City, Mo., and "Some of the Important Factors in the Development and Transmission of Natural Gas," by Mr. C. L. Bullock, superintendent of the Wichita Natural Gas Company.

On the last day of the convention papers on the following subjects will be discussed: "The Design and Construction of High-Tension Distributing Systems," by Mr. G. W. Saathoff, Empire District Company, Joplin, Mo.; "Irrigating Kansas Lands," by Mr. H. B. Walker, state irrigation engineer, Manhattan; "Determining Operating Costs of Power Installations," by Mr. C. A. Fees, Kansas Gas & Electric Company, Wichita, and a talk on "The Education of the Central-Station Staff in Kansas," by Mr. P. F. Walker, dean of the school of engineering, Kansas University, Lawrence.

The secretary and treasurer of the association is Mr. Ivor Thomas, 237 South Main Street, Wichita, Kan.

Destruction of Utility Plant in Conflagration at Hot Springs, Ark.

The public utilities of Hot Springs, Ark., suffered a severe loss Friday, Sept. 5, when nearly one-third of the city—fifty-five blocks—was destroyed by fire. The Citizens' Electric Company's power plant burned soon after the fire started, throwing the city into darkness and shutting down the traction service on account of lack of power.

Describing the extent of the damage done, Mr. S. E. Dillon, general manager of the company, reports by telegraph: "All generating units were destroyed, but boilers and accessories can be made serviceable. We have engineers here on the ground and hope to restore temporary service within two weeks. All poles and wires were destroyed throughout the burned district, and the overhead trolley system was more or less damaged for a distance of a mile. The fire originated in a gale blowing about 30 miles an hour, and no human efforts could control it."

Every effort is now being made to rush electrical equipment to Hot Springs for the early resumption of service. The Federal Light & Traction Company, 60 Broadway, New York, owns the Citizens' Electric Company, the Consumers' Gas Company, the Hot Springs Street Railway Company and the Hot Springs Water Company, having acquired these properties in March, 1913.

The fire started in a negro's shack on Church Street, four blocks east of the government hospital. The utility power plant was in flames within two hours after the fire

started, but General Manager Dillon and his assistants managed to save the records of the company, which were in the general offices adjoining the station. Great bravery was displayed by the plant engineers, who remained in the station to operate the electric service for the pumps delivering the water supply from the distant reservoir. These men left only when the fire was upon them, but fortunately escaped without much injury.

The auxiliary steam pumps at the water-works, 2 miles distant, had meanwhile been put in service, and there was no delay in supplying water for the fire lines. Though no rain had fallen for several weeks, the reserve capacity of the company's reservoirs was sufficient to maintain excellent pressure during the fire. This was the only thing that saved the rest of the city from destruction. Dynamiting was also resorted to to prevent the spread of the flames. This saved the government bath-houses, the Eastman, Arlington, Majestic and other large hotels, as well as the business section along upper Central Avenue. A part of the latter section of the city was, however, burned early in March of this year, and the section destroyed last week had previously been devastated by the fire of 1906, although the electric plant was not injured at that time.

A hurried survey of the power-house ruins showed that the 1250-kw turbine set could be rewound, but the smaller units, of 450 kw and 500 kw respectively, appear to be total losses. The motor-generator set and rotary converter will have to be replaced by new equipment. One condenser can soon be put into operating condition, but the other will be a loss. Most of the piping was destroyed. Two of the Stirling boilers can be repaired and utilized again.

Traction service was resumed in the city by means of two gasoline motor buses. Besides this, Mr. W. A. Haller, chief engineer of the Federal company, and Mr. Dillon hitched mules to the lighter street cars, so that the best possible service under the circumstances is now being given. Mr. Dillon also rigged up a temporary power line from one of the larger hotel plants to the newspaper offices, and the papers went to press twelve hours after the fire, missing but one edition.

Before the fire was out at Hot Springs the New York office of the Federal Light & Traction Company had become a scene of intense activity. The executive, engineering and purchasing departments began immediate preparations to rush new equipment to the stricken city at the earliest possible moment. The manufacturing companies were called upon to aid. Telegrams were sent to all parts of the country tracing turbines and other equipment, either new or second-hand, that could be bought and rushed to Hot Springs. The manufacturing companies were not able to supply all needs from their factory stocks but generously aided in this outside search. From Maine to California and Florida to Washington the telegraphic search is being made at the time this edition goes to press.

When it is considered that the whole city of Hot Springs is without electricity, some of it even without telephone service, and that the early resumption of its commercial life, the protection of the city and the dismissal of the soldiers now patrolling the streets are all dependent upon the Citizens' Electric Company's obtaining electrical equipment, and getting it quick, the reader will readily perceive the necessity of getting the apparatus on the ground and erected at the earliest possible moment.

It is now the belief that a new central station will be built on another site about a mile from the former plant. The old station occupied valuable space in the business section of the city which will now be more desirable for business purposes.

Rush orders have been placed for 3 miles of messenger wire, 2.5 miles of trolley wire and 3.5 miles of No. 0000 feeder wire. The express companies are co-operating with the city of Hot Springs, the federal and state governments and the utility company in facilitating shipments.

Mr. C. C. Chappelle, vice-president and general manager of the Federal Light & Traction Company, has personal charge of the rebuilding of the power plant, and Mr. W. A. Haller, chief engineer and general superintendent, is now at the scene of the disaster. Mr. George J. Gauthier, general construction superintendent, is assistant in active charge of the two score of linemen and others now engaged in the work of rebuilding. Mr. Lee Skipwith, of the company's New York office, has charge of the purchase of the new equipment.

Multiple Ornamental Flame-Arc Installation at Boston

The accompanying photograph shows the first application in the United States of the multiple ornamental inclosed flame-arc lamp, the installation being on the exterior of the Huntington Avenue Theater, in the Back Bay district of Boston, Mass. Eight lamps are in service, having

HUNTINGTON AVENUE THEATER, BOSTON, MASS., AT NIGHT, ILLUMINATED WITH INCLOSED FLAME-ARC LAMPS

been furnished by the General Electric Company's Lynn factory. Each is a 6.6-amp lamp equipped with yellow-flame carbons and operated in multiple with its fellows on a 113-volt, direct-current circuit. The lamps are spaced about 12 ft. apart horizontally and 15 ft. apart vertically and are installed on Lundin brackets of the ornamental type, the arc being carried about 3 ft. out from the wall and inclosed in a 16-in. globe. The lower row is about 35 ft. above the sidewalk. In an early issue the details of the lamp will be described.

Convention of Northwest Electric Association

On Sept. 3, 4 and 5 the Northwest Electric Light & Power Association held its sixth annual convention on the roof garden of the Washington Hotel, Seattle, Wash. The sessions were afterward declared to have been the most interesting and instructive ever held by the Northwest

association, and the large attendance present included delegates from Washington, Oregon, Idaho, Montana and British Columbia. A wide range of electrical topics was touched by the program, which was made up of three addresses and twelve papers.

In opening the convention, President W. J. Grambs, Seattle, referred to the subjects of labor, adequate compensation for employees, regulation by public service commissions, public education, and the methods and work of public service companies necessary to avoid unjust attacks. "It is only through education that we can stop the unjust criticism and confiscation of our utilities and acquaint the public with the fact that we are not indifferent to public opinion, and that we are simply co-operative institutions of officials, workers, investors and the public. The public must be taught to know that we are not ravenous creatures, taking its wealth from it unjustly, but that we stand for a square deal and an upright public policy," said Mr. Grambs.

"We must no longer be silent, but must be heard loud and often in reply to politicians and demagogues on the other side of the question. We have another duty to perform, if we wish to overcome adverse public criticism, and that is to do our work so well that the kicker will run out of ammunition. All complaints should be immediately remedied, if possible, immediately acknowledged, carefully investigated, and never pigeonholed, because there is usually a basis of truth in every complaint."

Mr. E. G. Robinson, manager of the Jim Creek Water, Light and Power Company, of Arlington, Wash., opened the afternoon session with a paper on "The Management and Operation of an Electric-Light Plant in a Small Town." Mr. Robinson's remarks included the recital of many sober and funny incidents which had come within the range of his work as manager of small-town properties, and aroused the greatest interest.

"Some Operating Problems" was the title of the next paper, by Mr. J. B. Fisken, superintendent Washington Water Power Company, Spokane, Wash., who outlined the relation of the operating department to other divisions of a given company and described in detail practical schemes of organization for such operating departments.

In his paper, "The Tireless Farmer—Results from Ruralizing Electricity," Mr. J. E. Davidson, general manager Pacific Power & Light Company, Portland, Ore., told in a comprehensive way of the uses of electricity in rural districts and advised methods to be employed by companies desiring to extend their lines for this class of business.

"The Regulation of Public Service Utilities," the paper by Mr. George A. Lee, outlined the benefits and dangers of regulating utilities, pointing to the advantages of state over municipal regulation and urging the enactment of further legislation to extend the scope of the state commission's power.

Mr. Norwood W. Brockett, Seattle, Wash., secretary of the Northwest association, followed with an administrative paper, entitled "Recent and Proposed Legislation Affecting Public Utilities." Acts of legislatures of the Pacific Northwest States concerning public utilities were discussed at length and the workings and interpretations of industrial insurance and commission acts were treated.

A paper entitled "Mechanical Devices in the Accounting Department," by Mr. Y. M. White, treasurer Washington Water Power Company, Spokane, Wash., described numerous appliances for office use, with their money-saving possibilities.

Mr. Henry L. Gray, former chief engineer of the Public Service Commission of Washington, next spoke on "The Valuation of Electric Utilities," discussing informally the methods employed and the benefits to be derived from appraisals, particularly in the case of valuations of smaller companies.

Thursday's session was closed with a paper entitled "Management of a Commercial Department," presented by Mr. A. C. McMicken, sales manager Portland Railway, Light & Power Company, Portland, Ore.

Friday's session was opened with the reading of a technical paper on "The Use of Protective Relays on Transmission Systems," by Mr. S. C. Lindsay, electrical engineer Puget Sound Traction, Light & Power Company, Seattle, Wash. Mr. V. H. Greisser, electrical engineer Washington Water Power Company, Spokane, Wash., followed with his paper entitled "Some Features of the Washington Construction Rules." Mr. W. H. Lines, industrial power engineer Portland Railway, Light & Power Company, Portland, Ore., then read a commercial analysis entitled "The Industrial Application of Electrical Heating."

"Electricity in the Lumber Industry," the paper presented by Mr. A. E. Ransom, manager of the Seattle office of the Coldwell Machinery Company, listed motor applications and specifications for mills and logging uses.

The last paper of the program was read by Mr. O. B. Coldwell, general superintendent Portland Railway, Light & Power Company, Portland, Ore., on "Synchronizing an Electric Light and Power Company's Records and Accounts with the Characteristics of Its Business." Mr. Coldwell's points provoked much interesting discussion.

The entertainment committee, of which Mr. A. A. Miller was chairman, arranged an excellent amusement program for the convention visitors, including several automobile rides, a banquet, a theater party, a picnic and dance, and a boat trip to the Puget Sound Navy Yard.

The annual election held Sept. 5 resulted in the choice of Mr. H. L. Bleecker, vice-president of the Washington Water Power Company, Spokane, Wash., as president of the association. The other officers elected were: Mr. E. G. Robinson, Jim Creek Water, Light & Power Company, Arlington Wash., vice-president for Washington; Mr. Franklin T. Griffith, president Portland Railway, Light & Power Company, vice-president for Oregon, and Mr. John McKissick, of the Northwest Light & Power Company, Wallace, Idaho, vice-president for Idaho. Mr. Norwood W. Brockett, Puget Sound Traction, Railway, Light & Power Company, was re-elected secretary-treasurer, and Messrs. M. C. Osborne, Washington Water Power Company, Spokane, and P. A. Bertrand, Gray's Harbor Light & Power Company, Aberdeen, Wash., were named as additional members of the executive committee.

Indianapolis Merger Situation

Following the order of the Public Service Commission of Indiana permitting the merger of the Merchants' Heat & Light Company and the People's Light & Heat Company of Indianapolis, the Indiana Trust Company, as trustee, has brought suit petitioning the court to vacate the order and asking that the People's company be rehabilitated as a going corporation. The plaintiff owns ten shares of stock in the People's Light & Heat Company, on which the commission fixed a value of $1,000. It is dissatisfied with this valuation and complains that the action of the commission is in effect an effort to appropriate its property without due process of law. The members of the commission and the two companies affected are named as defendants.

In the order of the commission, as handed down on Aug. 27, there were some interesting figures. The People's company has issued $300,000 in stock and an equal amount in bonds. The gross earnings from Oct. 1, 1912, to May 1, 1913, were $94,870 and the net earnings $32,221. The Merchants' company has issued $1,250,000 in stock and $2,500,000 in bonds. It has been furnishing electrical energy under contract to the People's company for some time. The price to be paid by the Merchants' company for the People's company is $525,000 in cash, and for the purpose of raising the money the former was authorized to issue $325,000 of 5 per cent bonds and to increase its capital stock by $250,000. The

bonds must net the company at least 89 per cent of par value and the stock must not be sold for less than par. A fee of $862.50 (15 cents on each $100) must be paid into the state treasury before the new bonds and stock certificates are issued. It is further provided that in future rate-making the duplicated value of property shall not be considered or the capitalization as increased by the merger order.

Personnel of Public Service Commissions

Mr. George L. Myers, assistant secretary Pacific Power & Light Company, Portland, Ore., wrote an article recently on the "Personnel of Public Service Commissions," which was published in the *Managers' Bulletin* issued monthly by the company.

Mr. Myers said in the article that regulation is no longer a subject of contention between party leaders or political parties, if it really ever was, and that it is not in any sense a partisan question. In its relation to public service corporations it is a question concerning which practically all people take common ground.

Much study and consideration have been given to the provisions of public utility laws in order to insure effective regulation, and too little study and consideration have been given to the personnel of public utility commissions. The kind of regulation that is to be had is entirely dependent upon the efficiency of the commissioners who do the regulating. If there is not an efficient and competent commission, there cannot be efficient and proper regulation. It is necessary that commissions be composed of men who can be fair and just to the corporations as well as to the public and impartial in their attitude and capable of judging the facts involved in cases with which they have to deal.

If political considerations make possible the appointment or regulation of a commissioner, such considerations are very likely to govern his conduct as a commissioner. It would be impracticable and undesirable to apply civil service rules and regulations because of the nature of the duties performed by a commissioner, but the method of selection should be such that the tenure of office would depend upon merit and service rendered.

Current News Notes

A BOY, A KITE AND A HIGH-TENSION LINE.—While a seventeen-year-old boy of Clinton, Mass., was flying a kite in that city Sept. 7, the wire attached to the kite came in contact with a 6600-volt transmission line. The youth was instantly killed by the shock.

* * *

AN ELECTRIC SEARCHLAMP REVOLVER.—A searchlamp revolver invented by Victor DeMarais, of Chico, Cal., is provided with a miniature electric lamp arranged to light the target at which the gun is aimed. It is said that the spot of projected light thus marks out in advance the point where the bullet will strike when the trigger is pulled. The device is patented and will be marketed by a California company.

* * *

EXAMINATION FOR FIRE-ALARM AND POLICE-TELEGRAPH ENGINEER.—An examination for the position of engineer of the fire-alarm and police-telegraph system of the city of Los Angeles will be held on Sept. 27. Its duties consist in designing, constructing and maintaining an independent fire-alarm system for Los Angeles. The salary is $250 per month. The examination is open to citizens of the United States who possess the necessary qualifications. Further information may be had by addressing the Civil Service Commission, 204 Exchange Building, Los Angeles, Cal.

PREVENTING CORROSION OF IRON.—As a part of its investigations relating to efficiency in mining, the United States Bureau of Mines has undertaken to develop a method of preventing the corrosion, by acid water from mines, of iron and steel used in mine equipment. Technical Paper 15—"An Electrolytic Method of Preventing Corrosion of Iron and Steel"—describes experiments in connection with an electrolytic method of preventing corrosion. The results appear to justify the hope that the method may be applied successfully for the protection of iron and steel in the construction of mining equipment, as well as for the protection of structures exposed to the acid waters of streams.

* * *

PICTORIAL HISTORY OF KEOKUK DEVELOPMENT.—A handsomely illustrated historical résumé of the construction work leading up to the completion of the Keokuk water-power plant is contained in Bulletin No. 10, just issued by the Mississippi River Power Company, Keokuk, Ia. Many of the pictures are in three colors, and the text completes the description of the electrical equipment begun in a preceding number. Summarizing the electrical portion of this great development, it is pointed out that the 150,000-hp generating station, the 150-mile, 110,000-volt transmission line of 90,000-hp rating and an extensive system of substations and distribution lines carrying energy to industries in Illinois, Iowa and Missouri have all been constructed and put into operation in less than eighteen months.

* * *

PITTSBURGH'S TEN-MILLION-DOLLAR SMOKE DAMAGE.—Mellon Institute, University of Pittsburgh, has issued its report on the Pittsburgh smoke nuisance, placing at $9,944,740 the damage done yearly in that city. This represents a per capita charge of about $20. Innocent suffer with the guilty in paying this tax, for, as estimated by Mr. John O'Conner, economist for the investigation, while the loss to the "smoke-maker" himself, due to imperfect combustion, is but $1,520,000, the cost to individuals in laundry bills amounts to $1,500,000 and that for dry-cleaning to $750,000. The extra cost to stores, wholesale and retail, is estimated at $3,675,000 per year; the extra cost to the household, including painting, renewal of wall-paper, etc., is placed at $2,332,000, and the extra cost to quasi-public buildings (hotels and hospitals) is $167,000.

* * *

BIBLIOGRAPHY ON ELECTRICAL WELDING.—The New York Public Library has just published a list of works to be found on its shelves relating to electric welding, compiled by Mr. William B. Gamble, chief of the division of technology. This bibliography is arranged in chronological order. Beginning with probably the earliest record in the library of exhaustive experiments on the melting of metals by electricity—a translation from the Dutch into German and published in Leipzig 1786-88—the list is brought up to the end of 1912 and contains references to articles on the subject of electric welding that have appeared in the English, German and French engineering periodicals, as well as books on the subject. An index of authors, with the dates of their articles, is also given. This excellent compilation will be found of value to all interested in the subject matter.

* * *

THE INDIANA ELECTRICAL BOOSTERS.—The Indiana Electrical Boosters were organized in Indianapolis on Sept. 6 at a picnic held at Germania Park. Plans for such an organization had been under way for some time. An annual picnic will be one of the features of the organization. Preliminary organization was effected and the organization will be completed at the convention of the Indiana Electric Light Association to be held on Sept. 24 and 25 at the Indianapolis Canoe Club. The purpose of the new organization is primarily to bring electrical men of the State together for social purposes. Those behind the movement say that the

electrical men of the State should have organized in a social way a long time ago and that now they will make up for lost time. It is believed that the new organization will work in entire harmony with the Jovian Order. At the coming Indiana convention local Jovians will hold a rejuvenation and joviation which promises to be very successful.

* * *

New Automobile Head-Lamp.—A new automobile headlamp which represents a radical departure from present designs has made its appearance in France. The lamp has the shape of a human eyeball and turns in its socket in exactly the same manner as the eye. Two small clamps controlled by thumb screws from the interior of the car hold the lamp in position in any desired direction, while the handle itself is used in turning the light rays to the side they are needed.

* * *

North and South America to Be Linked by Wireless.—Wireless telegraphy soon will be established between the United States and the South American republics, according to Dr. William Marconi. A fifty-year concession has been granted by the Brazilian government, which will enable the Marconi company to install a wireless-telegraph service between that country and New York. It is predicted that this will be the beginning of a network of communication between South America, the United States and Europe.

* * *

Storm Flood Stops New York Subway.—The worst tie-up by water in the history of the New York subway was experienced Sept. 5, when 3 in. of rain fell in two hours' time. From the overburdened sewers the flood poured down upon the underground tracks, finally obstructing passage of the trains and requiring that power be shut off in certain sections. At Times Square the water stood several feet above the up-town platform. Through traffic in this region was interrupted from midnight until 7 o'clock next morning, inconveniencing the early rush-hour passengers.

* * *

German Wireless System for South Pacific.—Germany is reported to be planning the establishment of an independent wireless-telegraph system among the islands of the South Pacific. A large station is to be built at Samoa with a range of 1870 miles, with stations in New Guinea and Marshall Islands, all interconnected and in direct communication with Europe by means of the Dutch cable from Yap, one of the islands in the Caroline group. Effort is also being made to open wireless communication between Nauen and Togoland, Southwest Africa, and the Cameroons, on the African coast.

* * *

Foreign Commercial Relations.—A concise volume, which contains statistics showing the foreign trade of each country of the world during 1911 compared with the previous year, has just been issued by the United States Bureau of Foreign and Domestic Commerce at Washington. This valuable publication shows the principal articles and their value entering into the trade of each country and the itemization of the imports from and exports to the United States. The statistics were prepared by American consular officers and supplemented by other official data. In addition to trade statistics, the grain crops and mineral output of the chief countries are given, thus presenting in compact form the principal features upon which the commerce and industries of the foreign countries depend. The volume should prove highly valuable for reference purposes, having been revised and brought up to date so far as statistics were available. Copies of the book may be obtained from the Superintendent of Documents, Washington, D. C., for 35 cents each.

SOCIETY MEETINGS

Nashville Jovians to Have Lunch Club.—A permanent local lunch-club organization has been effected among the Jovians of Nashville, Tenn., Mr. J. P. Brown, superintendent of the Nashville Railway & Light Company, having been elected president, and Mr. J. P. Lawrence, of the Habrick-Lawrence Company, secretary. The initial session was called by Statesmen R. C. Leonard and J. A. Cayce, Jr., of Nashville, and was presided over by Past-Jupiter Oscar C. Turner, of Birmingham, Ala.

* * *

American Electrotherapeutic Association. — The American Electrotherapeutic Association held its twenty-third annual meeting at New York, Sept. 3 to 5, many prominent physicians from this country and abroad being present. Dr. F. B. Granger, Boston, read a paper on "Ionic Medication," and Dr. B. S. Price, New York, discussed electrical methods of treating stubborn diseases. Others who presented papers were Drs. Anthony Bassler, New York, "Electrotherapeutics"; J. A. Rivière, Paris, France, "Treatment of Cancer"; Jean Bergonie, Bordeaux, France, "Inducing Exercise to Cure Rheumatism, etc.," and Dr. George M. McKee, New York, applications of the X-ray.

* * *

Jovian Field Day at Bridgeport, Conn.—On Jovian Day, Sept. 6, the Jovians of Bridgeport, Conn., held a rejuvenation at Rivercliff-on-the-Sound and initiated fifty-two candidates under the direction of Statesman Carl F. Siemon. One hundred and fifty sat down at the shore dinner which followed the ceremonies, and there were speeches by Mayor Wilson of Bridgeport, Reigning Jupiter F. E. Watts of the Jovian Order and Mr. A. N. Palmer. The work of the degree team was highly complimented. Assisting Statesman Siemon were Messrs. James Dunn, George S. Hadley, James W. Morey and A. E. Frost. A number of visiting Jovians from New York and New England attended the outing, which closed with a variety of field sports.

* * *

National Council of Industrial Safety.—The second safety congress of the National Council for Industrial Safety will be held at the Hotel McAlpin, New York City, Sept. 22 to 25, in conjunction with the meeting of the Association of Iron and Steel Electrical Engineers. The second day will be given over to an educational session, with Mr. Arthur Williams, of the New York Edison Company, presiding. Among the features of an elaborate program, Dr. John Price Jackson will discuss the Pennsylvania Department of Labor and Industry, of which he is commissioner. Mr. George Westinghouse is also scheduled for an address on the subject of "Manufacturers." For the "safety" dinner of Sept. 24 Mr. Elbert H. Gary will act as toastmaster, and addresses are promised by President Wilson and by Secretary of Labor Wilson.

* * *

Institute of Radio Engineers.—The newly incorporated Institute of Radio Engineers held its first meeting for the present season at Columbia University, New York, Sept. 3. Vice-president Marriott commented on the practical achievements of radio workers during the summer and announced the incorporation of the institute under the laws of New York State. The list of active members now numbers well over 200 and includes many prominent radio engineers in England, Europe, Australia, Africa and South America. An interesting and well-illustrated paper by Dr. Hans Rein, of the Lorenz company in Germany, describing the theory and apparatus of the "Multitone" system was read by Dr. Goldsmith and was followed by a long discussion. The next meeting will be held on Oct. 1, and the institute's invitation to attend is extended to all who are interested in radio work. A paper on the new equipment of the American Marconi company will be read.

Development of Alabama Water Powers

System of the Alabama Traction, Light & Power Company, Ltd., of Birmingham—Hydroelectric Station on the Coosa River and Steam Station at Gadsden—110,000-Volt Transmission

THE Alabama Traction, Light & Power Company, Ltd., Birmingham, Ala., owns extensive water-powers in Alabama. It now operates public utilities in several cities, the energy being generated by steam plants and one water-power plant rated at 1500 kw.

The company has just completed a steam turbo-generator plant of 1250-kva rating at Gadsden, Ala., and has under construction a water-power development at Lock 12 on the Coosa River, which will have an ultimate rating of 80,000 kva.

The plans of the company contemplate a very extensive development with a network of over 800 miles of high-tension transmission lines, reaching into every part of the State. With the growth and development of the State of Alabama, this system should become one of the greatest in the world, as there are over 500,000 hp available in the hydroelectric sites controlled by the company.

Present Hydroelectric Development

Lock 12, the site of the present hydraulic development, is situated about 50 miles from Birmingham and 50 miles from Montgomery, the two most important cities in the State. Montgomery is the capital and is the center of the cotton trade, and Birmingham is the "Pittsburgh of the South," with its coal, iron and steel industries. The Lock 12 development involves the erection of a gravity-type dam of cyclopean concrete, nearly 1700 ft. long and 80 ft. high, making available a head of 68 ft. Forming part of the main dam is a power house 324 ft. long and 80 ft. wide, which is situated on the west bank. The lock for navigation will be built on the east side of the river beyond the end of the main dam, by cutting a channel through a natural depression.

Four 17,500-hp vertical, single-runner turbines of I. P. Morris manufacture will be installed at present, leaving space for two future units. These are the largest single-runner units ever built for 70-ft. head, and the spiral casings and draft tubes for the units will be molded directly in the concrete of the power-house sub-structure.

Generating Apparatus

A single-piece shaft will connect the turbine runners directly to the generators, which will be made by the Westinghouse Electric & Manufacturing Company and are three-phase, 60-cycle, 13,500-kva, 6600-volt, 100-r.p.m. machines. These units are characterized by their simplicity and compactness. They are entirely self-contained. A cast-iron speed ring is first bolted in place above the draft tube, and to this is bolted a cast-iron foundation ring, which extends up to the generator-floor level. The generator is placed directly on this ring, so that all the load is transmitted directly to the solid foundations through the foundation and speed rings. This will make the erection of the units very simple, as once the speed ring is properly set all the rest of the apparatus is bound to line up. Another feature is the placing of the thrust bearing, which takes the entire weight of the revolving parts and the hydraulic thrust above the generator. It is supported by a very massive bridge bolted to the generator frame. The bearings are of the Kingsbury type, which have been operating so successfully in recent installations. Direct-connected exciters are used and are carried on an extension of the shaft directly above the Kingsbury bearings. The exciters are rated at 150 kw at 250 volts. The turbine governors will be made by the Lombard Governor Company and are of the same type as those installed in the Mississippi River Company's plant at Keokuk.

The generators are connected in "Y" with the neutral brought out. Eight thermocouple exploring coils are installed in each generator.

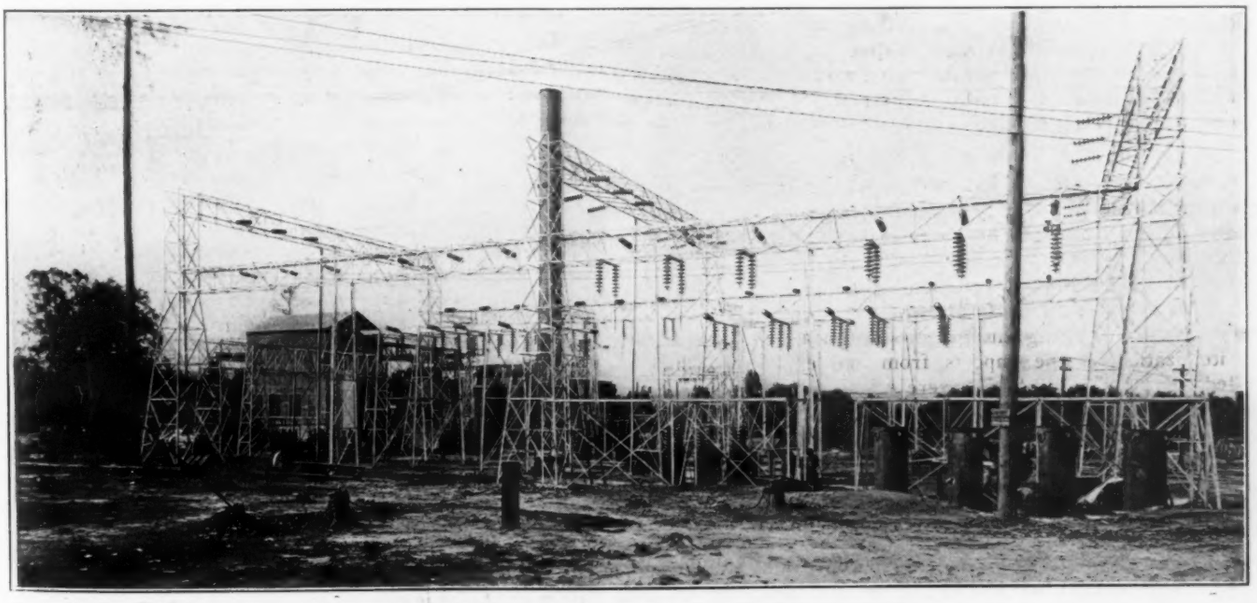


FIG. 1—GADSDEN OUTDOOR SUBSTATION FROM THE SOUTH

Switching and Control

The switching and control of the station are extremely simple, yet flexible. Each unit may be connected by an oil switch, either directly to its own bank of transformers or to the 6600-volt transfer bus.

The high-tension switches are of the indoor type and will be located on an upper floor of the power house above the main generators.

brought to the switchboard, the armatures being connected through a double-pole, double-throw switch to the generator field. All switches and switchboards will be of the General Electric Company's make. The aluminum-cell electrolytic lightning arresters will be placed on the roof.

At present two 110,000-volt double-circuit transmission lines are being built. One goes directly to the Birmingham substation, a distance of 50 miles, and the other crosses

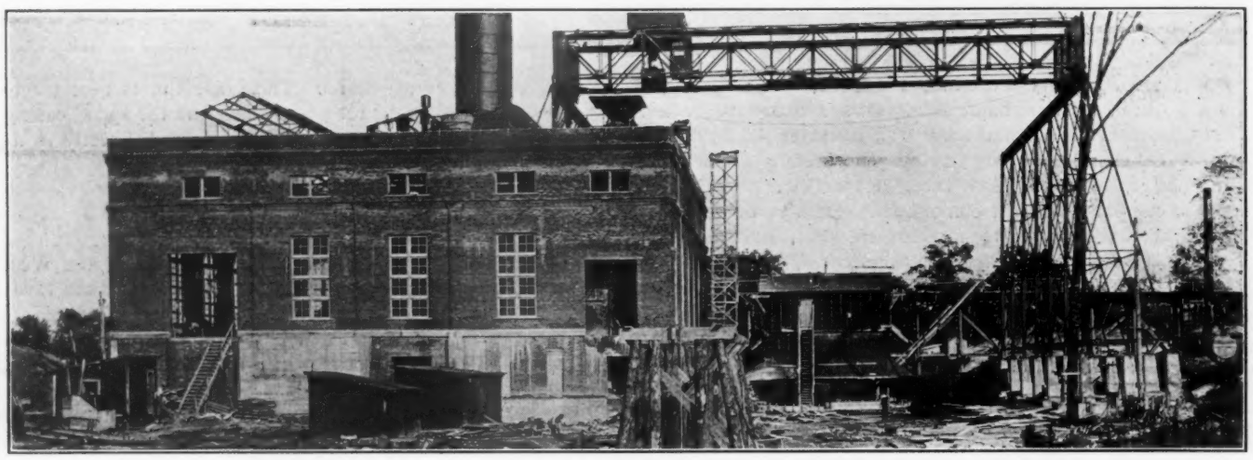


FIG. 2—GADSDEN STEAM PLANT FROM THE WEST

Each bank of transformers consists of three single-phase, oil-insulated, water-cooled, 60-cycle, 4500-kva, 6600-volt to 110,000-volt transformers, connected in delta on the low-tension side and in Y on the high-tension side. Four banks will be installed at present, one for each generator.

The transformers may be connected on the low-tension side, either directly to a generator or to the transfer bus, and on the high-tension side to either an outgoing 110-kilovolt line or to a 110-kilovolt transfer bus. This permits

the river and goes to Gadsden, via Sylacauga, Talladega, Jackson Shoals (where the 1500-kw water-power plant is situated) and Anniston, tying into the steam plant at Gadsden.

Transmission Line Details

Each circuit will be of 00 copper seven-strand conductor, with 55,000 lb. tensile strength. Six-disk Thomas or Ohio Brass suspension insulators will be used with seven-disk

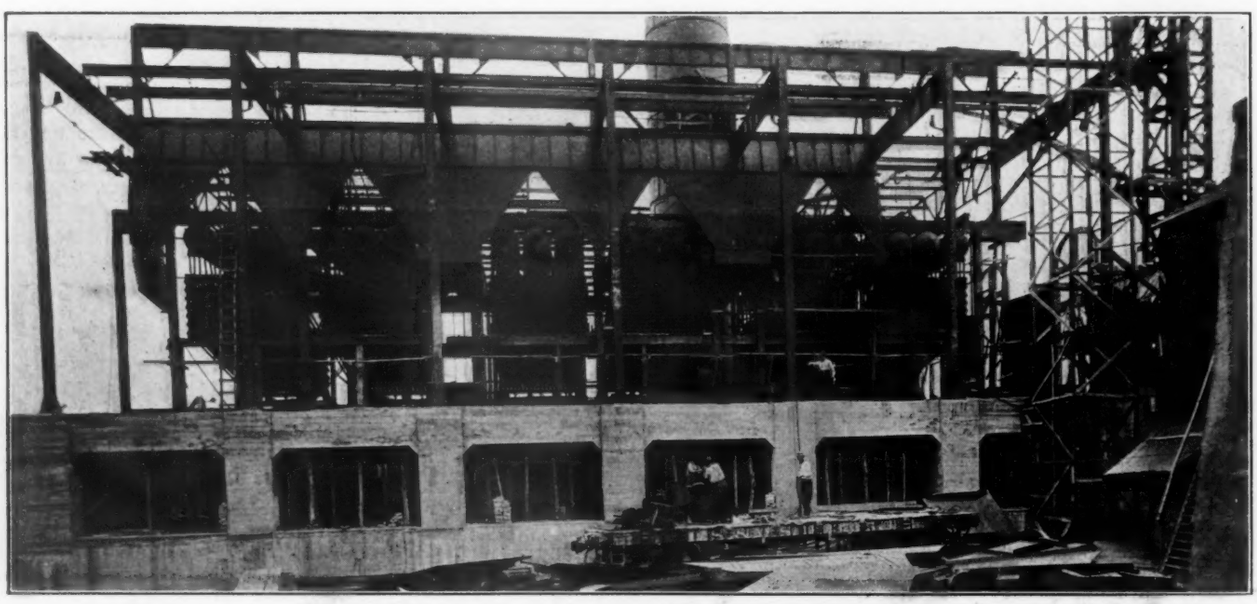


FIG. 3—BOILER EQUIPMENT IN GADSDEN STEAM STATION

putting any machine on any transformer bank and line.

A complete water-cooling system will be installed for the transformers, also an oil storage and an oil filtering and drying outfit.

Each generator has its individual regulator. One motor-generator exciter of 150-kw rating will be installed for emergency service, and it can be connected to any generator. Nothing but the exciter shunt-field leads is

strain insulators at the strain towers. These six-disk units will withstand 350,000 volts dry and 255,000 volts wet before they flash over, and they are designed always to flash over before puncturing. The mechanical strength test is a tension of 5000 lb. applied in line with the axis of the insulator, and the insulators when they are tested to destruction must have a strength that will not fail under less than 10,000 lb. pull.

TRANSMISSION TOWERS

The towers are manufactured by the American Bridge Company. The standard tower on the Birmingham line, known as the "A" tower, weighs 4400 lb. and is 68 ft. high. It carries two ground wires and has 10-ft. vertical spacing between conductors. The middle cross-arm is extended 2 ft. beyond the upper and lower cross-arms to avoid any possibility of trouble due to the lines coming together when

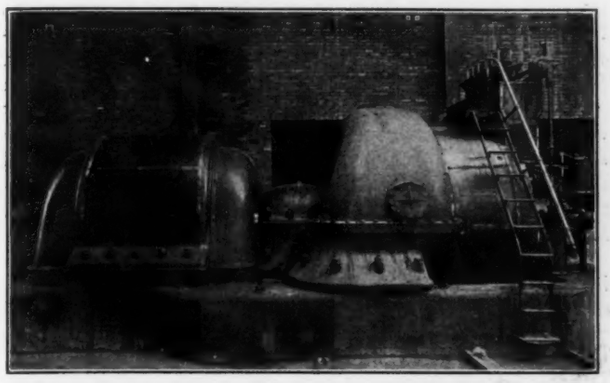


FIG. 4—GADSDEN STEAM PLANT, HORIZONTAL TURBINE UNIT NO. 1

they unload sleet or ice unequally. These towers, which are designed for normal spans of 700 ft. with 1200 ft. maximum, are built with an all-metal footing 2.5 ft. square, set 7 ft. in the ground, so that no concrete will be used. The base of the towers is 17 ft. square.

For the line to Gadsden two types of towers are used. The standard tower, called the "C" tower, weighs 3500 lb., is 65 ft. high and has the same spacing of arms as the "A" tower. It also carries two ground wires. The normal spacing for these towers is 600 ft. and the maximum allowable span is 900 ft.; the base is 16 ft. square.

The strain towers, "B," weigh 4500 lb. and have a base 17 ft. square, otherwise they are of the same general type as the "C" tower. The "B" towers are used at all angles over 3 deg. and up to 35 deg. When on a tangent "B"

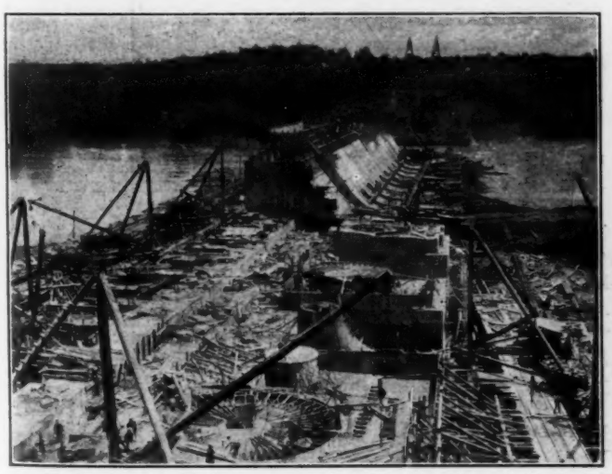


FIG. 5—CONSTRUCTION WORK IN PROGRESS ON THE DAM AT LOCK 12

towers will be spaced every 2½ miles and the lines strained up at that point. The minimum clearance of conductors above the ground is 25 ft. on all lines. The right-of-way for transmission lines is 100 ft. in width.

Uninterrupted service being the first criterion, careful study was given to the telephone system, and it was finally decided to install the telephone lines on a separate creosoted pole line 10 ft. from the edge of the right-of-way. Twenty-five-foot poles are used with a single cross-arm, and No. 8 hard-drawn copper is used throughout. The telephone poles are spaced 175 ft. apart and the line is transposed at every fifth pole. The insulators used are of porcelain and were designed for 6600 volts.

LIGHTNING PROTECTION

The territory in which the company operates is subject to

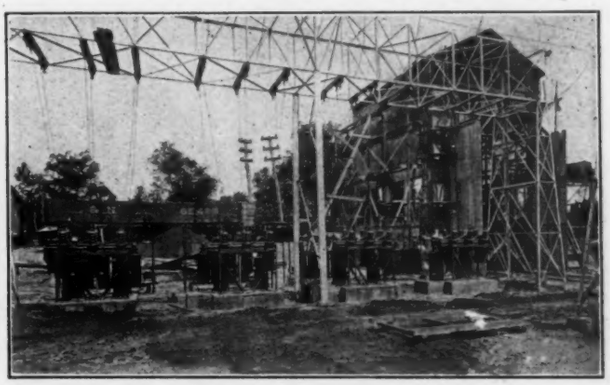


FIG. 6—SUBSTATION LIGHTNING ARRESTERS AND TRANSFORMER REPAIR HOUSE

very severe lightning storms, and particular attention had been paid to protecting both the 110,000-volt and the 22,000-volt lines. The transmission voltage was fixed at 110,000 volts after a careful investigation of the present and future market. With this voltage energy can easily be transmitted as far north as Nashville and Chattanooga, Tenn., as far west as Memphis, Tenn., and Meridian, Miss., east to the state line, and south to Mobile, Ala., and Pensacola, Fla. New Orleans is about 300 miles away, and would call for a spiral boosting station, or else a 150,000-volt line running direct from one of the company's future plants.

Local distribution will be by 22,000-volt lines. The single-circuit lines consist of creosoted long-leaf yellow-pine poles, 12-lb. treatment, with wishbone type metal cross-arms and pin-type insulators. The double-circuit lines will be

FIG. 7.—DOWNSTREAM VIEW OF SPILLWAY, STREAM-CONTROL CULVERTS OPEN, LOCK 12

built on either poles or flexible towers of the Archbold-Brady type. Both pole and tower lines will carry a ground wire. A tension of 22,000 volts was chosen, because the bulk of the load will be widely scattered.

GADSDEN STEAM PLANT

The Gadsden steam plant is situated on the bank of the Coosa River about 2 miles from the city of Gadsden. The

installation consists of two 6250-kva General Electric horizontal turbo generators, with Worthington condensers. Condensing water is taken through an intake, from the Coosa River. The boiler plant consists of six 600-hp Babcock & Wilcox boilers with Murphy mechanical stokers. Coal is dumped from a trestle into the coal-storage yard alongside the boiler house. From here it will be handled

FIG. 8—GADSDEN OUTDOOR SUBSTATION TRANSFORMERS

by a traveling crane with 110-ft. span, using a 1-ton bucket, and dumped in the hopper above the boilers. Storage for 9000 tons is provided.

The generators are wound for 2300 volts and the voltage will be stepped up by two banks of three-winding transformers to either 22,000 volts for the local distribution system or 110,000 volts for the high-tension transmission. The transformers are single-phase, 2100-kva units of the outdoor type as are also the oil switches.

Outdoor Substation

The outdoor substation is situated about 400 ft. distant from the power house. All control switches and switchboards are placed in the main power house, and the 2300-volt cables from the generators are carried underground from the power house to the transformers.

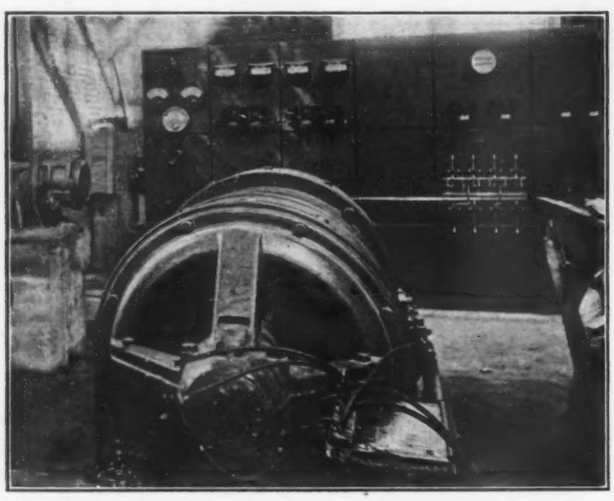


FIG. 9—GADSDEN STEAM MOTOR, GENERATOR, EXCITER AND AUXILIARIES

The substation is out of the ordinary, in that it takes care of four 110,000-volt transmission lines, steps up the generating voltage of the 10,000-kw station to either 22,000 volts or 110,000 volts and also steps down the 110,000-volt transmission tension to 22,000 volts.

The steam plant which has just gone into operation will serve to build up the load for the water-power plant, after which it will be used as a reserve plant. Judging from river gagings taken over a period of fourteen years, the steam plant will increase the permissible sale of primary, 50 per cent load-factor power from the hydroelectric plant by 20,000 kw and will operate for only about 5 per cent of the time.

All 110,000-volt substations will be of the outdoor type and will be standardized as to size and type on 3000, 6000 or 10,000-kva rating. A small building will be put up to house the meters and control apparatus. A spare transformer will be carried in stations of 10,000 kva or larger. Smaller stations will have the transformers connected in delta, so that in case of trouble with one transformer they can be operated in open delta. All transformers will be single-phase. The transmission line will be sectionalized at every transformer station, or about every 25 miles, so that trouble on the company's lines can be quickly located and repaired.

The Alabama Traction, Light & Power Company, Ltd., is incorporated under the laws of Canada, with its main office in Montreal. The securities of the company are

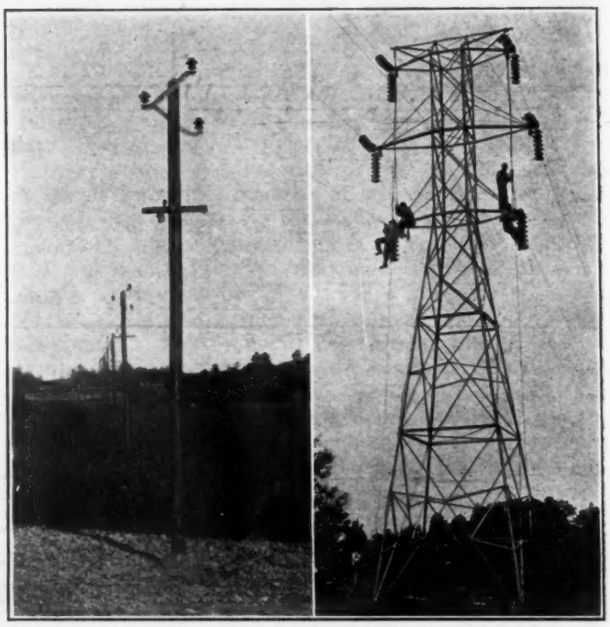


FIG. 10—22,000-VOLT POLE LINE, SYLACAUGA-ALEXANDER CITY TRANSMISSION LINE

FIG. 11—LINEMEN PULLING UP CONDUCTORS ON TOWER, LOCK 12, ANNISTON LINE

largely held in England by the clients of Sperling & Company, bankers, of London, but there are also large stock holdings in New York and Alabama. The operations in Alabama are being conducted by three subsidiary companies owned by the Traction company—the Alabama Power Company, the Alabama Power Development Company and the Alabama Interstate Power Company.

The engineering staff of the company is headed by Mr. E. A. Yates as chief engineer, who has as his associates Mr. E. L. Sayers, as assistant chief engineer, Mr. W. E. Mitchell, as electrical engineer, and Mr. O. G. Thurlow, as designing engineer. Mr. James Mitchell, of London and New York, is president, but the active management of the companies is in charge of Mr. W. Winans Freeman, vice-president and general manager.

The other officers and department heads of the Alabama Company are: Mr. M. Webb Offut, assistant to the vice-president and general manager; Mr. F. S. Ruth, secretary and treasurer; Mr. Wiley Alford, assistant secretary and treasurer; Mr. Thomas W. Martin, general counsel; Mr. J. C. Halstead, manager land department, and Mr. E. S. Centter, Jr., puchasing agent.

Commission Control of Public Utilities*

The chairman of the Wisconsin commission points out ways by which that body has brought about better franchise conditions, improved service and scientific rates—A careful and moderate discussion of the modern practice of regulation

As plants can neither be constructed nor operated except by virtue of a grant from the municipality or state, it is vital both to the owners of such plants and the public that the rights of each and the corresponding duties of the other in respect to the public functions of the public utility be clearly defined and maintained in a spirit of fairness and justice to both parties. These obligations have generally been prescribed in the franchises granted by the municipalities as state agencies, or by the state itself, conferring upon the grantees the right to construct, maintain and operate such plants. But as the term of a franchise must of necessity be for a long period in order to induce capital to invest in the enterprise, experience has demonstrated that it has been impossible to fix terms and conditions of the franchise satisfactorily to meet unforeseen and unforeseeable exigencies which arise in the progress of time from many causes.

CHANGES IN THE ARTS

No one can prophesy the changes in the arts embraced in public utility services, the developments and necessities of the communities served or the requirements of the utilities to perform their functions under changed conditions. In the last few years enormous increases in cost of material and labor which enter into and become part of the cost of the service which the public utility is obliged to furnish are an element that has not always been counterbalanced by the economies resulting from new inventions and increased business, and unless the charges for the service could be increased in such event it would result, in case of the weaker utility, either in an impairment of the quality of the service or in financial embarrassment of the corporation or individual rendering the service.

As an illustration of another burden that is often cast upon a utility and which may not be anticipated when the franchise is granted, we may refer to the advancement in the art of telephony, which within a very few years has been little less than marvelous. Costly telephone equipments have been scrapped and entire systems reconstructed to meet the public requirement for the best service. The art of generating electric current has also advanced with such rapid strides that the expensive electric equipment of a few years ago is to-day found in the scrap pile, having no other value than that of junk. In other utilities the changes have not been so marked and equipment has become more or less standardized, but who can tell what a quarter of a century may bring forth in any of the arts or sciences?

Under the circumstances it is not at all strange that all attempts rigidly to prescribe in detail the obligations of the public utility to the public and vice versa during the life of a franchise have generally met with signal failure. To meet existing conditions, attempts have frequently been made to change the terms of the franchise. This has often resulted in engendering animosity between the public authorities and the management of public service corporations. The negotiations have not always been free from the suspicion that improper methods have been employed to induce those representing the public in the transactions to consent to terms and conditions detrimental to public interest. As a result such public service corporations become a factor in local politics, and questions involving the most important interests of both the public and the corporations have become issues in local political campaigns. Such issues often involve economic laws and sound business principles which cannot be determined by the votes of an uninformed electorate. These unnecessary conflicts between the public and those rendering public services are the cause of more corruption in municipal government than anything else.

Students of economic science have for many years been endeavoring to devise a limited franchise which would be adequate during the term therof to meet the requirements of the public as well as those of the public service corporations, but they have found it impossible to frame a model franchise of any character based upon sound economic principles which could either be limited in time or could prescribe definitely the charges to be exacted or the quality of the service to be rendered during the life of the franchise. If a franchise is to be limited in time, provision must be made for its amortization. Ths compels the public not only to pay a fair return upon the investment during the life of the franchise but also to provide a sinking fund which, with the scrap value of the plant at the termination of the franchise, is equivalent to the original investment. Others have advised the adoption of franchises for long periods of years, reserving to the municipal councils the right to fix rates and establish standards of service at definite intervals or from time to time at the will of the councils. The general experience under franchises of this character has not been such as to warrant their commendation. The expenditure of large sums of money by some of the larger cities to ascertain all the essential facts necessary for intelligent and lawful action on the part of common councils invested with power to establish rates has been more frequently wasted than profitable, as the facts thus acquired have generally been ignored and action taken which was either prompted by prejudice cr based upon political consideration.

From an economic standpoint, an unlimited franchise with the provision that the municipality may revoke it at any time upon condition that it acquire the plant by paying to the company the reasonable value thereof is generally regarded by those who have given the subject exhaustive study and consideration as the best kind of franchise. The necessity of the service in all probability will not terminate with or prior to the time of the expiration of the limited franchise. It must be obvious to all who have given the subject any serious consideration that an indeterminate franchise containing the provision that the rates and services shall at all times be subject to revision by an impartial and independent tribunal will result in the greatest good to the public as well as to the investors in such enterprises. It will eliminate all friction between the community served and the agency serving it. Naturally such a policy would be opposed by the average municipal politician who rides into office either as a champion or an opponent of the public utility which usually constitutes a factor in municipal politics.

*From an address delivered by Mr. John H. Roemer, chairman of the Railroad Commission of Wisconsin, at the Association Island meeting, Sept. 4, 1913.

The Indeterminate Permit

It was with a view of placing public utilities upon a sound economic basis and eliminating all unnecessary friction between the public and such concerns due to causes arising from ignorance of the economic status of public utilities and their moral and legal relations to the public that the Wisconsin public utilities law was framed and enacted. That public utilities are virtually monopolies by nature and must be dealt with as such in any just and comprehensive system of state regulation is the fundamental economic principle upon which the law was constructed. Without protection of such monopolies only a limited and inadequate supervision of their affairs by public authorities can be morally justified. At the very foundation of the Wisconsin system lies a uniform indeterminate franchise, denominated "an indeterminate permit," which gives the corporation a legally protected monopoly. It can never be deprived of its property unless the municipality determines to acquire the same, and then just compensation must be paid therefor, which is fixed and determined by the commission.

Valuation of Plants

Every element of value, both tangible and intangible, is to be considered in reaching a result, excepting only franchise values, which are necessarily excluded by the general policy of the law. The object to be attained is the fair value of the property as a going concern. This, in the contemplation of the statutes, is the proper capitalization upon which returns must be allowed.

The elements usually available for consideration are the original cost of construction, the amount expended in permanent improvements and extensions, the reproduction cost and the same less depreciation, and the going value. In arriving at a fair and equitable appraisement of the physical structure the commission has considered, as more or less controlling, the reproductive cost based on the average prices of material and labor for the five years immediately preceding the time of appraisement. The results thus attained have been so obviously just and equitable that the muicipalities and the utilities generally have acquiesced therein. Nevertheless, for the sake of comparison and illumination of the subject, the reproductive cost based on current prices also is considered. The commission has never confined itself to any one basis to the exclusion of others in reaching a conclusion. Every factor bearing upon the subject is carefully weighed and such importance given to it as the situation in the light of all the circumstances demands. While a form of universal application might be desirable, yet, from the very nature of the undertaking, such is impossible. In the last analysis enlightened judgment and conscience must be applied to the facts in hand if a just determination is to result.

Classifications of Accounts

The uniform classifications of accounts have now been in effect for over three years. In addition to the utilities operating under them in Wisconsin numerous companies in other states as well as in other countries have voluntarily adopted the prescribed accounts with little modification. One of the features of these accounts, in which the classification differs from similar prescribed classifications in other parts of the country, and concerning which it was submitted at first to much criticism, is that it endeavors to serve as a basis for ascertaining the cost of service. Although it is self-evident that no business of the character involved in public utility service can be successfully conducted without an accurate knowledge of the cost of rendering the service in which the utility is engaged, it was surprising to learn that while the best conducted privately owned utilities had in a measure recognized the importance of such information and had somewhat imperfectly attempted to ascertain the same, the majority of the managers of municipal plants had generally been wholly oblivious to the necessity of any such knowledge.

Municipal Plant Accounting

This lack of efficiency on the part of the managements of municipal plants has been due partly to various causes, many of them beyond the control of the municipal utility plant. The first of these is the question of organization and responsibility. A part of the public function or department of city government is frequently administered by a superintendent, board of public works, engineer, board of commissioners or committee of the common council, and it is frequently difficult to ascertain just where the duties of these individual city officials begin and end. The matter of rotation in office seriously interferes with continued efficent management.

Accounts pertaining to municipal plants were often meregd with other accounts of municipalities, and even where separation was made the accounting was so crude and inaccurate that it was impossible to ascertain therefrom even approximately the cost of any class of service.

The local authorities in control of municipal utilities were at first slow to respond to the demands of the commission, except in the most progressive communities. In some instances it appeared that those in charge of such plants were apprehensive that proper methods of accounting might result in disclosures reflecting upon the capacity or integrity of the management. In other instances there seemed to be no one in the organization of employees capable of keeping a set of books intelligently. This was particularly true where the management changed with the municipal administration. However, in practically every community where the management was intrusted to a non-partisan board whose personnel was more or less permanent there was no difficulty in securing hearty cooperation in putting into effect the prescribed system of accounting. At the present time, practically every utility within the State, whether municipally or privately owned, is now keeping its accounts according to the system prescribed by the commission.

As the various plants are classified according to size, comparison in results of operation between plants in the same class has proved of inestimable value to the managements of all plants, either publicly or privately owned. By studying the accounts of the various plants the commission is enabled to become familiar with the details of operation of each plant and to point out to the management economies that may be adopted and improvements that may be made in the conduct of the business.

Regulation of Service

To detect violations of the rules relating to service, the inspectors of the commission are constantly traveling through the State making secret inspections. These rules differ materially from those in vogue in other states and countries. They place the responsibility for the character or the quality of the service primarily upon the utility, which is requred to test its own meters and make various other specific tests of the quality of the service prescribed in the rules and regulations, and also to keep a record of the results of all such tests, which must be kept open for public inspection. While the accuracy of meters is an essential element in the economic use of both gas and electricity, the maintenance of adequate pressures is more essential to the efficient use of either. Consequently, general systematic surveys of gas pressures and electric voltages by means of recording instruments are made. The electric inspectors take continuous records of voltage over the distribution systems, calibrate the companies' standard instruments and supervise the testing of consumers' meters and the renewal of incandescent lamps.

When the general survey of the service in the State was first made it was found that few of the plants were able

to comply with the prescribed standards without making alterations and improvements. Hundreds of thousands of dollars were spent by the different utilities in order to bring their equipment to the point where compliance with the rules of service was possible. Many of the managers of the municipal plants were reluctant to make the necessary changes in order to improve the quality of their service; nevertheless, through persistent importuning and threats of prosecution on the part of the commission, the necessary changes are being made gradually and additional equipment installed where necessary.

At the time that systematic inspection was undertaken only about fifteen of the 250 electric plants in the State, serving some 15,000 consumers, were giving reasonably satisfactory voltage. In order to comply with the requirements of the rules of service, about forty plants had to be generally overhauled and practically reconstructed. In the remaining plants it was necessary to install governors, automatic voltage regulators and additional transformers, and also to make extensions and changes in the structure of the plants and distribution systems. Some of this work has not yet been completed and it may be stated that about 50,000 consumers of electric current out of a total of 75,000 are now receiving satisfactory electric service as measured by the prescribed standard. In this connection it must be borne in mind that the state regulation of voltage is new and that work similar to this in scope has never before been attempted. There is as a result of the improvement of service, according to the computation of the engineers of the commission, a money saving of at least $75,000 annually to electric consumers.

Action on Rates

At the time that administration of the law was first undertaken it was found that there were few public utilities in the State which did not have in effect a large number of discriminatory rates. While all had established schedules of rates, the departures from such schedules were numerous. Free and reduced rates were given to favored persons. Many thousands of such discriminations were in existence. While the practice of discriminating between patrons in the matter of rates and service had become general, as is usually the case where there is no independent tribunal provided by law charged with the special duty of enforcing the obligations of public utilities to the public, it was difficult for the utilities, in many instances, to wipe out the discriminations of their own accord. These had often been forced upon the utility by those having more or less influence in the community and who were in a position to harass the utility through the common council and otherwise unless they were favored as patrons. Such influences were not entirely unlike those which, a few years ago, often compelled railway companies to indulge in similar practices. By a general order, the commisssion compelled every utility in the State to eliminate discrimination of all kinds and charge in every case the regular schedule rates.

As rates made by the commission are based upon the cost of service, the commission has in each instance where a schedule of rates has been challenged worked out a scientific schedule which classified the services according to the cost thereof. The result of this has been most gratifying. Business has extended and the returns to the public utility increased. As an illustration, one of the largest public service corporations in the State, operating both a gas and an electric plant, valued at approximately $1,000,000, was obliged in a rate case to put into effect a scientific schedule of rates which provided a reduction of the maximum rates theretofore in effect but so classified the service that the consumers in each class were paying for the services rendered rates based upon the cost of the service to the utility. The company estimated that the new schedule of rates would operate to reduce its net revenue approximately $30,000 per annum. Much to the surprise of the management, the business at once began to develop, and as a result of the expansion thereof within less than two years the management voluntarily applied to the commission for authority to make a further reduction of rates. This is but one of the many instances of the character that might be called to your attention.

In order to facilitate work along lines of establishing scientific schedules of rates, the commission has published the rates, rules and regulations of all the utilities in the State, and by comparison and by the use of hypothetical plans has demonstrated what are reasonable rates, rules and regulations. In a number of cases small utilities have asked the commission to revise their entire schedule of rates. In fact, utilities often come to the commission asking that a schedule of rates be provided which will develop their business. Generally the managements of the utilities carefully study the decisions of the commission, and they are often thereby able to adjust their schedules of rates upon the principles which govern the commission in its actions.

Perhaps the larger number of utilities in the State are today operating upon schedules which are more or less scientific and based in a measure upon the cost of the various services rendered. It is gratifying to know that such utilities as have established such schedules of rates have been able to extend their business greatly, increase their operating revenues and their net incomes, and reduce the cost of the service to the consumers.

Rate of Return

Inquiry is often made by those interested in utilities outside of the State of Wisconsin as to the rate of return that is allowed to a utility in Wisconsin. In reply to this it may be said that the commission has never established and does not intend to establish any fixed rate of return.

State Regulation Preferable

Intelligent regulation of public utilities requires engineering, accounting and statistical skill of a high order. Those intrusted with the work of investigation and study of the various subjects presented for consideration must have scientific knowledge in the respective branches or departments of utility management and operation. With a competent staff of experts in the different lines of service, engaged constantly in examining plants throughout the State, it is possible for the regulating board to bring to the solution of every problem arising a breadth of vision and experience that is invaluaole both to the public and to the utility.

No regulation can be effective which is not based upon accurate information and which is not actuated by a sense of justice and equity. In the light of the past, it must be conceded that an independent tribunal, free from local influences and prejudices and assisted by a corps of trained experts, is better qualified to regulate efficiently public service corporations and individuals engaged in public services than any municipal council or local tribunal. In few instances would it be possible for municipalities to maintain the necessary organization of competent assistants to deal intelligently with the problems involved in the regulation of public utilities. The cost of such an organization would be prohibitive to most municipalities. In central control there is therefore not only efficiency but also economy. One body can serve all municipalities as well as one municipality and serve them better.

After five years of administration of the Wisconsin law, the results obtained from its operation have been generally satisfactory. Our experience indicates that a comprehensive system of regulation such as provided by our law is, not only advantageous to the general interests of the public but is of benefit as well to the business interests of the utilities.

Financial Needs of the Electrical Industry*

A significant statement and original analysis of recent growth and future capital requirements—The present status of electrical securities before the investing public—How to acquire and hold public confidence

By Frank A. Vanderlip

Four hundred million dollars a year, $8,000,000 a week, of fresh capital can profitably be used in the development of the electrical industry in the United States during the next five years. What the calls for new capital might reasonably be expected to reach after five years no one can predict with accuracy, but I believe it is a conservative estimate to say that the intelligent development of the industry as a whole will readily absorb $400,000,000 per annum for the next five years, if that amount is available.

In making such an estimate, one does not need to draw on one's imagination. There is no need to picture broadening fields of application, new methods of production and distribution, nor new uses for energy. A survey of what has been going on about us comes near enough to being a fairy tale. Little more is needed than a grasp of present-day statistics, compared with those of five or ten years ago, to give the basis for such an estimate.

We have seen the cost of construction and equipment of all central stations increase in the five years from 1902 to 1907 from $500,000,000 to well over $1,000,000,000, making an increase of 117 per cent in that five-year period. We have seen the output in that time go from 2,500,000,000 to nearly 6,000,000,000 kw-hr., making an increase of more than 133 per cent. The five years from 1902 to 1907 is the last period for which we have complete statistics for the whole country. The government is now collecting the figures for the five-year period ending with last year. In doing that schedules have been sent to 7000 stations and power plants, compared with 4750 in 1907—and it has been estimated that the cost of construction and equipment of central electrical stations will show an aggregate in 1912 of $2,000,000,000, as against $1,096,000,000 five years ago. Here, then, has been a requirement in five years for central station work alone of $900,000,000, or, roundly, $180,000,000 a year, as against a similar requirement in the preceding five-year period of $100,000,000 a year of new capital.

When we think what is certain to be done in the way of electrification of steam railroad terminals and heavy mountain grades, when we reflect on the larger use of electrical energy for industrial power, in agricultural uses, and in the continued growth of necessary interurban lines, we do not need to look further into the possible development of the industry to see a requirement for $400,000,000 a year of new capital.

That means an $8,000,000 new capital issue every week for the next five years. It is such a capital requirement that you gentlemen are facing, and which must be successfully met if your energies are to have an adequate field of display. Can you get it?

Capital Needs in All Fields

It seems to me that there is no more interesting question that can be proposed to those interested in the electrical industry. When the matter is put so concretely as a new $8,000,000 capital issue every week for five years, the size of your financial problem can be readily grasped. To get a full appreciation of the difficulties, you may well glance outside of your own field, however, and note that there will mature within that five-year period well over $1,000,000,000 of steam railroad securities. We may well note, too, that railroad development in the last five years called for from $2,500,000,000 to $3,000,000,000 of new capital, and I would say that there is every reason to expect at least as great demands, in addition to the refunding operations in the next five years. The railroads, then, in five years will need, say, $4,000,000,000 for refunding and fresh capital. States and municipalities, should they take no more new capital in the next five years than they have in the last five, will absorb in the neighborhood of $1,500,000,000 more, so with the $2,000,000,000 your industry will need, there should be provided between now and the end of 1918 between $7,000,000,000 and $8,000,000,000 for these three purposes alone, to say nothing of general industrial and other needs.

These are bewildering figures. They sound more like astronomical mathematics than totals of round, hard-earned dollars. The raising of these sums, however, is the practical problem that financiers have directly before them.

Financiers must count on two elements over which they have no control if they are successfully to accomplish the gigantic task. One factor is the size of the possible investment fund itself—the question of whether or not there can be made available a total amount of capital for fresh investment that will meet the demand which can be clearly foreseen in these three directions alone—that of general transportation, the production and application of electrical energy, and municipal capital expenditures.

The second factor is whether or not the outlook in these fields of investment is such that the elements of adequate return and ultimate safety will satisfy the owners of capital and lead them to direct such a vast stream of new investment into these fields.

At this time I will not attempt to go into the first factor —the size of the possible investment fund. That would require a world-wide survey of the growth of wealth and an examination of the effect of modern legislative tendencies; it would need an examination of the drain which the vastly increased rate of taxation here and abroad is putting upon capital; of the terrific wastes of militarism, that cancer which is eating into the financial life of Europe at such an alarming pace, and of the other phases of government expenditure, national, state and municipal, which are absorbing such vast totals of capital into public and largely non-productive uses. It would necessitate taking note of the tendency toward individual extravagance, a tendency that is world-wide and which is cutting into the investment fund to a startling degree.

The Electrical Outlook

Passing entirely this important side of the subject, making no examination as to whether or not the investment fund can possibly be large enough to meet the demands that can be clearly foreseen, let us take up only the narrow question of whether or not the outlook in the field of electrical industry is such that there is promise of adequate return and ultimate safety sufficient to warrant an expectation that $400,000,000 a year of fresh capital will flow into the electrical public utility field.

In spite of the vast proportions that the electrical industry has already reached, the huge total of capital investment which it represents, the substantial standardization of the

*An address delivered by the president of the National City Bank of New York at the Association Island meeting, Sept. 5, 1913.

business, the complete social and industrial necessity which your work has created and met, electrical securities are still regarded by the general investor, the capitalist, as occupying a new and only moderately seasoned and tried field for investment.

THE INVESTOR IN ELECTRICAL SECURITIES

Among ten average investors in corporate securities, perhaps not over one, certainly not over two, have as yet invested at all in electrical securities. I think it is conservative to say that among individual investors certainly not over 20 per cent in numbers have yet recognized that securities issued by electrical corporations have come within a range which will permit investors conservatively to employ their funds in that field. It is not easy for you, perhaps, to realize how very recently it is that the whole field of your business has reached a point where an investor might fairly feel that he was not entering a field of experimentation, that the art was sufficiently advanced and standardized to make it reasonably sure that some brilliant inventor would not upset all financial calculations, that the most up-to-date establishment might not be turned into scrap by advances made in the science long before the investor had made important inroads on the coupon sheet of his bond. As that feeling of insecurity passed and the business became more nearly standardized, there then came to be emphasized difficulties in regard to franchises, until the very phrase "public service corporation" carried with it to the investor's mind unpleasant pictures of difficulties with boards of aldermen, of threatened charters, expiring franchise rights, new forms of taxation, state-fixed rates, and profit divisions with municipalities before undreamed of.

INVESTORS FEAR POLITICS

Four out of five investors at the present time have their minds closed against any investment in securities of electrical corporations, and that is true largely because they fear the effect of present political conditions and tendencies. An investor who has such a fear may not be marching in step to the so-called new freedom; perhaps he does not recognize fully the force of the principles advocated in our new progressive politics. But remember he still controls his own capital; remember that it is his individual decision that determines in what field that capital will be invested. The problem that the banker has to face is to convince investors holding such views that capital issues of this type are attractive, and when you ask bankers to convince enough investors of this so that they will absorb $8,000,000 a week of new capital issues, you are outlining a large task.

The time has now come, in my opinion, when no man with capital to invest in corporate securities, if he has a desire for return that is any larger than government obligations will pay, can longer hold back from the study of public utility investments. The experimental inventive stage is past. The business has a background that has now become broad enough so that one can make valuable comparisons and sound deductions. It has ceased to be a business of only small units, and the tendency is markedly in the direction of great capital issues which shall have at all times a broad market. The dangers from a prejudiced, unwise or unfair vote by a municipality or a board of aldermen are being greatly lessened by the newly organized public service commissions, and these same bodies, recognizing the monopoly character of the business, are guarding it from useless and venal competition, as they are also guarding the investor from too free capital issues by the optimistic developer or the enthusiastic promoter.

We are a long way from having either uniform or satisfactory administration of public service commissions, it is true. This word commission has a sound of wisdom, experience and justice about it, but after all commissions are but composed of men, and sometimes of very poorly equipped even if honestly intentioned men. All this takes us into the question of government itself; but I think no one will deny that the securities of public service corporations are sounder and their future more secure, on the whole, because of the tendency to place the affairs of these corporations under the control of public service commissions.

MEET PROPER PUBLIC DEMANDS

If I may be permitted to say so, I believe the highest duty that you men who are managing great public service corporations owe to the business in which you are engaged, the greatest service which you can perform for the future development of this field, lies in the clear recognition by you of the true public service character of this business and in meeting honestly, intelligently and freely the proper demands that the public makes upon you.

Your dream is of great central stations that will supply energy to vast communities, and from which will radiate trunk lines that will become as necessary in the lives of communities as are lines of transportation, that will produce electricity which will become almost as essential to our every-day life as the blood in our arteries. That dream is fast becoming a reality, and it is right and proper that the public should hold over those who create such a situation a wise and just control. In the degree in which you recognize and meet this right of the public will you get fair treatment in return.

The public is by no means all-wise, when it is not well informed, nor is it always just. You can cite many instances, in your own field, of injustice and of unwise forms and methods of control, but I believe you will find back of every injustice which you have received at the hands of the public some measure of injustice, or unfairness, or lack of sincerity and frankness, on your own part in dealing with the public.

This business you are in requires qualities of statesmanship as well as inventive faculties, technical skill and business acumen. It requires clean-cut recognition on your part that you are creating a condition of affairs wherein the business in which you are engaged becomes of vital necessity in the life of the community, and you cannot and ought not to expect the community to fail to safeguard itself.

The measure in which you recognize the justice of the public's rights, the activity and skill with which you educate the public so that it can make wise decisions, the extent to which you refrain from unfairness or rapacity, and thus give ground for greater unfairness and rapacity in the public's dealings with you, will, to a large extent, be the measure by which capital will come to recognize the security which this form of investment offers.

HOLD TO HIGH STANDARDS

Those of you who keep in mind most clearly that any deviation from the highest standards on your part in dealing with the public is apt to lead to unfair retaliation and unjust regulation by the public of the business in which you are engaged will find that you are creating about your properties an atmosphere which will encourage the investment of fresh capital. Nor will it be enough for you to be fair and just. You must be both patient and energetic in educating the public, in giving them information which will permit them to form wise conclusions, to make sound laws and to recognize the tremendous importance of both high character and broad intelligence in the men who are appointed to positions on public service commissions.

The field is new. The unavoidable mistakes even at the hands of wise men will be many. In the end those mistakes will react on the development of the community itself, and if the voters can be brought intelligently to recognize this, there will be a strong force of public opinion to compel the appointment of properly qualified men to these positions of far-reaching influence.

Not only must you throw all the force you can in the direction of securing properly qualified men on the commissions, but you must more broadly inform the public, so

that the commissions will have back of them wise laws, framed by men who intelligently comprehend the new and intricate problems which your development of the industry has raised.

To-day one of the greatest difficulties that the financial world encounters with public service commissions is on the ground of delay. Sometimes commissions fail to recognize the necessity for prompt action. Frequently they are so burdened and overladen with matters requiring their judgment that it takes months, or even runs into years, before decisions are rendered. Those charged with the duty of financing public service corporations have perhaps more ground for just complaint over commission delays than against the character of decisions after they are made. The commissioners themselves are by no means to blame for these delays. Not infrequently an impossible task is given to them to perform. I believe if the public understood this it would not be difficult to obtain laws which would permit the appointment of extra commissioners, or assistant commissioners, or in some manner to subdivide the work so that public business might be promptly cared for.

If, on the whole, the industry can look forward to fair and intelligent treatment at the hands of voters, municipal authorities and state commissions, it is reasonable from other points of view to anticipate that capital will be found to supply the needs for the development of the next five years, not to look further ahead than that. Nothing in connection with the business is more obvious than that the tendency is toward large units, large corporations and large issues of a single type of security. That all tends directly toward an absolute essential if we are to have a market for public utility securities as broad as the present market for railroad securities. There must be large issues, large enough to warrant the most careful investigation by issuing houses, large enough to make a market that investors can buy and sell in readily, and large enough so that there will be many minds centered on the operating facts back of that security, making the market price of that security represent the combined judgment of many investors, rather than merely the price placed on the security by an issuing house.

The investor wants large issues, but not at the price of over-capitalization. There has been much progress in the last few years in the direction of large issues, which has been brought about through the formation of holding companies that control a number of individual plants. In the creation of these holding companies there has frequently been a tendency toward over-capitalization, toward the building of one corporation on the junior securities of another, and even on the consolidation of holding companies and the creation of another type of security still further away from a primary lien. That tendency should be halted. There is quite enough imagination inherent in the business itself, without letting the imagination of the promoter come into play in creating issues with remote liens.

Principles for Holding Companies

The holding company theory, I believe, is admirable. It scatters the risk; it affords intelligent supervision and engineering; it makes possible cheaper purchasing of supplies; it gives a broader market and a lower cost of capital—but the relation of total capital to total income involves principles that a holding company can no more transgress with impunity than can the original corporation.

If the investor turns from these large considerations, involving the relation of the properties to public opinion and civic control, and the relation of capitalization to reproductive property values and to earnings, and looks at the technical side of the business in the present state of the development of the science, at the outlook for broader uses, for more economical production, and at the growing necessity of society for the product which you furnish, then indeed there will be seen ground for the most optimistic view.

As I look back on my boyhood days I think perhaps the keenest hours of pleasure that I can remember were when I was deep in Jules Verne's "Twenty Thousand Leagues Under the Sea" or "The Mysterious Island." I have recently had a pleasure almost akin to that in reading from government reports some statistical abstracts setting forth the course of electrical development, and in studying the report of the committee on progress of the National Electric Light Association. That report of the committee on progress comes as near being a true fairy tale as I know of in current literature. It makes me envious of you men who are engaged in a field that has in it such possibilities—such certainties, one may better say, for the report deals with accomplishments rather than expectations.

Imagination in the Electrical Industry

Diversity factors, off-peak loads, the concentration of central stations, the opening of new fields for the use of energy, and the more complete filling of old ones, makes reading that fires one's imagination. The making of two blades of grass grow where one grew before becomes commonplace by the side of your accomplishments in cheapening the production of electric energy either by water-power conservation or central-station consolidation. When you add to that the economies of diversified load and open up the fields that low-priced current and off-peak loads make possible, you have created a business situation where there is as much need and opportunity for sound imagination as has ever existed in business life—imagination, not mere dreaming, but imagination that means the correlation and new application of known facts. Sound imagination here has unlimited play, and you need it all through your organization and down to every subordinate who comes in any real contact with the problems of labor and the practical affairs of life. As great rivers have affected population or railroad trunk lines have defined development, so will these distributing lines, carrying cheap electricity, affect our future growth.

The nation owes the greatest credit to those among you who have seen this clearly and who are contributing in the largest measure toward a fuller realization of all the possibilities. The man who conceived a 40,000-hp generator is as much entitled to honors at the hands of our government as the men who built the steamship *Imperator* were entitled to be decorated by their government.

The Reduced Cost of Electric Living

You are selling one of the few commodities that have gone down in price, while the cost of nearly everything else that enters into our life has gone up. I note that in seven years in which the cost of living is calculated as having advanced 37 per cent the average cost of electricity has gone down 17 per cent. You are in the one line of business where the theory of consolidation seems to be fully accepted by everyone who intelligently understands the factors. Elsewhere in business there is a tendency on the part of the public to break up large organizations, but in your field the monopolistic nature of the business is recognized and there is the strongest tendency toward consolidation, and you are demonstrating, in consolidation, the greatest economies.

I note that forty-nine central stations in Illinois have been closed up and that four are doing the work better. I read that 400 central stations in New York State might better give way to forty, or even to ten. I see it demonstrated that what was originally your main business, the furnishing of electric light, is now but incidental, and I am told that the economies of diversified load are so large that the great steam railroads will undoubtedly be able to buy power from central stations having that diversified load-factor more cheaply than they can produce it from their own central stations, however large their requirements may become. The diversity of load-factor which permits the serving of the countless needs of a great community from

a central station, and which leads to organization on such a scale that the highest intelligence can be afforded for every detail of supervision and engineering, is the direction in which we are obviously and rightly moving.

An independent municipal lighting plant is either an indictment of the intelligence of the community where it is located, an indication of its failure properly to supervise and control the corporation operating there, or a criticism of the severest character against the management of the private companies. The government might as well undertake the organization of transportation lines solely for service in connection with the post office to carry the mails as for a municipality to undertake economically to produce electricity solely for street lighting.

The interesting statistics of your business show far more rapid increase in gross earnings than is shown by the railroads of the country, great as that increase has been. What is still better, in the face of a rapidly decreasing price at which energy is sold, net earnings show a greater percentage of increase than gross, while the tendency with railroads is distinctly in the opposite direction.

ELECTRICITY IN INDUSTRIES

No phase of electrical statistics strikes me as being more interesting than the growth of the use of electric power in our industries. In ten years the horse-power of electric motors in use increased from less than 500,000 to nearly 5,000,000, until to-day about a quarter of the primary power used in the industries of the United States is furnished by electric motors. The most casual study of that development indicates that as yet it is but getting well under way, and that there are as striking advances to be made in the next few years as have been made in the last half dozen.

The statistics of the last five-year period, on the average cost of installations per kilowatt capacity, bear impressive testimony to technical progress, showing as they do marked and steady decline in the cost of installation and the consequent cheapening of product. To a layman it would seem that no field offered more attractive possibilities on the technical side than further improvement in long-distance transmission which will still further broaden the field of operation of a central station and tend toward larger units and economical consolidations.

To-day a quarter of the total industrial power utilized in the United States is electrical. I am told that competent authorities believe that fully 85 per cent of the total industrial power can eventually be economically taken over by central electric power stations. This means an addition of more than 10,000,000 hp with the present volume of industry and an expenditure in central-station construction of $1,875,000,000 for the production of that amount of electricity.

Those of you who are close to and an intimate part of the astonishing development of the electrical business find these, and a hundred other interesting facts that might be stated, but the commonplaces of your every-day business. They are such sound and substantial facts that you perhaps marvel that four out of every five investors in corporate securities have never bought an obligation of a public utility corporation. You can see how it is possible soon to be furnishing 15,000,000 hp instead of 5,000,000 hp to the industries of the country. You can see how it is inevitable that great central stations will produce electricity so cheaply that all the energy that is required for wide communities will soon be coming from single central stations.

INVESTORS WANT FAIR PUBLIC TREATMENT

On the other hand, I can see that, with a little more time for investors to become convinced that a public-service corporation is not another name for a target against which to level unfair state and municipal enactments, we may have four out of five investors buying such securities, rather than refraining from doing so.

In the mind of the investor, the outlook for fair public treatment of public-service corporations is the most important single factor in directing investment of capital toward or away from the electrical field.

I firmly believe that this matter of fair public treatment lies largely in your own hands. If you will do so as well with that as you are doing with the technical side of the business, the $400,000,000 a year of fresh capital which you need will be forthcoming.

Analysis of Cost of Electric Drive in a Foundry

In recommending the installation of electric motors from the central-station standpoint it is often desirable to consider group drive as an entering wedge, leaving individual drive for later investment after the consumer has become thoroughly acquainted with the convenience and economy of electric service. In the ensuing paragraphs are given the data of a cost analysis in a modern foundry for which a motor-service survey was made by the local central station. The table gives the list of tools and motors required to operate them.

DATA ON TOOLS AND MOTORS

Five polishing jacks One 50-lb. trip-hammer One shear One blower	Shaft speed 300 r.p.m. One 23-in. pulley	5-hp motor 1700 r.p.m. 4-in. x 4-in. pulley
Two 7-in. stones 125 r.p.m. 30-in. pulley	Shaft: One 30-in. pulley One 12-in. pulley	10-hp motor 1710 r.p.m. 6-in. x 5-in pulley
Two 75-lb. trip hammers 325 r.p.m. 13-in. pulley	Shaft: One 12-in. pulley One 7½-in. pulley	5-hp motor 1700 r.p.m. 4-in. x 4-in. pulley
Three 16-in. lathes One 18-in. lathe One 24-in. lathe One 12-in. lathe Two speed lathes One 20-in. upright drill One sensitive drill Two shapers One planer One milling machine	Shaft: 125 r.p.m. One 22-in. pulley Countershaft: One 30-in. pulley One 8-in. pulley	7½-hp motor 1710 r..pm. 6-in. x 5-in. pulley

The total installation aggregates 27.5 hp of connected load, and the estimated monthly energy consumption is 1328 kw-hr., giving a net bill of $49.17 per month for electricity. The average load is estimated at about 7 hp. The present cost of operating the foundry by steam power is:

	Per Year
150 tons coal, at $4.75	$713.00
Engineer, two hours per day, at 25 cents per hour	150.00
288,000 gal. water, at 10 cents per 1,000 gal.	28.80
Oil, waste, etc.	50.00
Ash removal	24.00
Taxes, insurance, depreciation, interest and repairs	135.00
Total ($91.50 per month)	$1,100.80

The first cost of motors is as follows:

One 5-hp motor	$72.00
One 10-hp motor	158.00
One 5-hp motor	72.00
One 7.5 hp motor	135.00
Total	$437.00

With the most liberal allowance for fixed charges and such steam-heating service as may be necessary after electric drive has been installed, there is indicated a decided saving by the use of central-station service.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Commercial Methods and Results at Kokomo, Ind.

In shaping the local advertising of the Indiana Railways & Light Company at Kokomo, Ind., advantage is taken of timely newspaper topics to catch and hold the reader's attention for the central-station message which follows. Thus, at the time of a recent sensational escape in the East, a display "ad" gave prominent position to a scare heading into which a commonplace house-wiring exhortation could be read.

The contract agent of the Kokomo company, Mr. O. M. Booher, reports that by such timely advertising and special offers the sale of flatirons in Kokomo, a city of 20,000 inhabitants, has reached a total of 1685. A campaign instituted for gaining 1000 new customers during the year of 1913 is also progressing satisfactorily. A circular dial in the commercial office shows that already more than 500 of these new customers have been added to the company's circuits. As it is a matter of record that more new business is obtained in the latter part of the year than during the first six months, the hopes of the commercial department for a 1000-customer gain will doubtless be fulfilled.

A Pleasure Car's 82-Mile Country-Road Run

The electric pleasure car shown in the accompanying illustration recently made the round-trip run from Washington, D. C., to Baltimore, Md., and return on a single battery charge. At the time of this trip part of the road had just been heavily oiled by the State Road Commission. This condition materially checked the machine. At one point heavy sand was encountered but the machine, a Detroit Electric, had no difficulty in pulling through it. The car left Washington at 7:40 a. m. and four hours later

ELECTRIC PLEASURE CAR ON WASHINGTON-BALTIMORE RUN

was in the downtown district of Baltimore. The run through Baltimore was over cobblestones. The drive back to Washington occupied an hour longer, as it was necessary, because of road repairs, to return by Hyattsville and the Queen Chapel Road.

The car arrived in Washington in excellent condition and with sufficient energy remaining in its batteries to travel a number of miles further. This car had already been driven 6213 miles with the same equipment.

Not long ago the Washington-Baltimore round-trip run was made by an electric truck of the same manufacture carrying a load of 1200 lb.

Nickel-Plated and Costly Heating Appliances

Critical comment on the use of nickel-plated finishes for electric-heating devices is contained in the following letter received from the manager of a Middle West central-station company:

"Nickel plate is all right in its place," he writes, "but it is bad policy to make it the chief feature of a heating appliance. The gas people have been a long time at their business and have passed the nickel-plate stage long ago. Their chief effort is to make the toaster, the broiler and the iron do the business, and they make these things inexpensive in order to sell the gas. But the aim of manufacturers of electrical apparatus is to make profits in the sale of their wares, letting the central station do the best it can with the resulting situation. Flatirons are now beginning to be sold at a somewhat reasonable price, but this has been accomplished only because new manufacturers entered the field and forced prices down.

"Taking, for example, an electric stove with two heating plates and an oven with two heating plates, it is manifest that the material and workmanship in such a stove are not so much as in a gas or gasoline stove of the same size. But such gas, gasoline and oil stoves can be bought at about one-third of the price of electric stoves of like capacity. The experimental stage is passed. The heating element is now cheap and reliable, so that in reliable flatirons the elements are guaranteed for all time. We feel that the prices for stoves and all other electric utensils will similarly come down to a par with their competitors' within the next two or three years, and we do not propose to promote the use of electric stoves and utensils until they are on the market at reasonable prices. We would then place a separate watt-hour meter on such services, charging our regular motor rate, which ranges from 5 cents to 2 cents per kw-hr."

Watt-Hour Meter Testing for Central Stations

By C. W. Ward and H. N. Stroh

The writers have designed and put in use for the Duquesne Light Company, Pittsburgh, a test board or rack in which two or more portable service types of rotating standard watt-hour meters may be checked at the same time against a carefully calibrated laboratory rotating standard.

The device reduces to a minimum the labor expense involved in the weekly checking of a number of portable standards, yet enables the inspector to maintain a very high degree of accuracy.

Primarily the rack is a large container built to accommodate the number of rotating standards desired. Westinghouse standards of the 5-amp to 40-amp, 100-200-volt type are employed by the Duquesne Light Company, and the rack in use is built for twenty standards. The rack can, of course, be built to accommodate any type of standard.

From the accompanying photograph and sketches one can see at a glance the adaptability of the rack and realize what a time saver it is.

The meter movements as a whole are removed from their wood-carrying cases and their drums and contact fingers are carefully inspected, after which dust and foreign particles are blown out with heated compressed air. The complete movements are then inserted in the various compartments as shown. These compartments are so designed that the element has as exact a fit as when in its carrying case, being level, sealed from air currents, and with the shunt (potential) coils automatically cut into the circuit on the under side of the potential binding posts through the medium of the two springs shown on the left side of each compartment. These springs make a most positive connection and cannot get out of order.

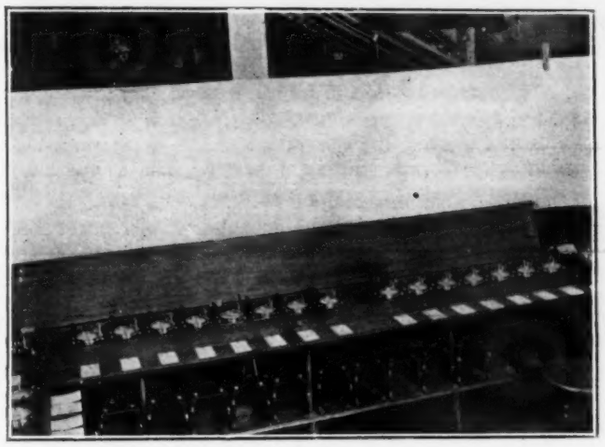


FIG. 1—RACK FOR TESTING WATT-HOUR METERS

The potential-coil connections are wired up in a special way to compensate for the drop in voltage when a large number of the standards are being checked at one time.

The series (current) connections to the standards are made by short, flexible leads coming up from the rear of the rack, along which run two flat copper buses, each capable of carrying 100 amp. From the sketch showing the rear of the rack it will be seen that these strips are split alternately at each meter and that no two adjacent meters are cut in on the same strip or bus. Such an arrangement neutralizes the effects of any stray fields set up by these buses. The master meter employed as standard is of the regular Westinghouse rotating type with a few special modifications insuring greater accuracy and facility of handling. These modifications have been worked out in the laboratory and have been conceded by meter experts to have considerable merit.

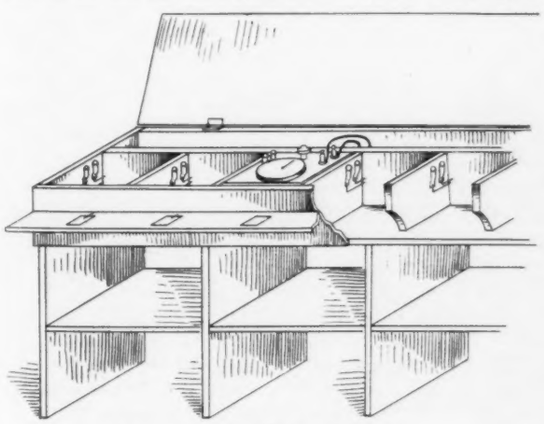


FIG. 2—FRONT VIEW OF RACK

Testing includes a check upon each series and shunt instrument winding and the error taken as final in each test is the average of three checks under each condition.

The usual method of returning to zero the pointer of each meter being checked is to employ a switch in the potential circuit of each. This method is slow and unsatisfactory. On this rack the front is hinged so that it drops down with counter-weights, thus exposing the moving element of each standard. The disk is then turned by a light pressure of the finger and the pointer brought exactly to zero at once. The calibration card for each meter is always exposed for entries, being held by a spring clip on a small shelf directly in front of its respective meter. This shelf also prevents the warping of the hinged door, which effectively seals each compartment against the influence of air currents. A latch similar to that employed on refrigerators is used to hold this swinging front tightly in place when closed.

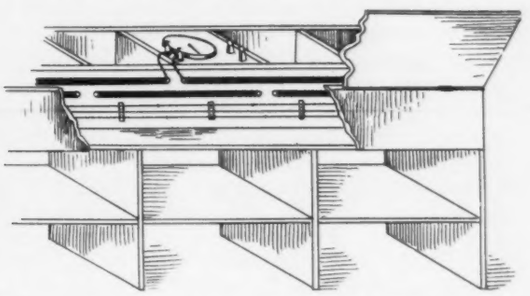


FIG. 3—REAR VIEW OF RACK, SHOWING CURRENT BUSES AND POTENTIAL CIRCUIT

Shelves are made underneath each compartment for the storing of the empty meter cases while the elements are under test. A hinged cover fits over the entire top of the rack, which is closed when not in use.

Each series winding is tested at full, half, tenth and twentieth load current and at both voltages, a total of ninety-six tests for each meter. These tests are made on Sunday, all standards being brought in Saturday by the testers. Thus on Monday morning a carefully calibrated standard is ready for each tester for his week's work.

Co-operation with the Sales Department

What are the functions of the sales department? Is it limited and circumscribed to the making of contracts and nothing more? "In Detroit we think that its scope is very much broader," explained Miss Sarah M. Sheridan, sales manager of the Edison Illuminating Company of Detroit, in a paper delivered before a recent convention of the sales managers of Edison illuminating companies held at Association Island, N. Y. An abstract of the paper follows:

In the central-station business no sale can be considered as a closed transaction. The company in selling its commodity is performing a service which it aims to make continuing to each customer. The appointment of the sales manager as special agent of the company carries authority to make and sign the company's contracts for the sale of electric energy; to make adjustments, settlements and cancellations of such contracts, and to procure by lease or purchase easements and rights-of-way for the electric lines of the company.

This implies that the department shall not only find a market for the company's output and constantly increase that output by securing new customers and finding new uses but shall also settle all complaints, disputes and claims concerning service or charges. In fact, the Detroit department disposes of all complaints whatsoever in the first instance.

The Fundamentals of Courtesy and Fair Dealing

An advertised expression of a courteous and fair-dealing policy makes little impression on the general sentiment of a community. But such a policy lived up to year in and year out in all relations with individual members of the same community builds up for a company a public good-will that is invaluable. The courtesy of the sales department expressed to the public through its salesmen who are securing business is of little value in creating favorable public sentiment if the construction department, for instance, in order to keep down costs, disregards the same public in setting its poles without thought of public convenience, or ruthlessly sacrifices trees to facilitate its own work, or if an underground department persistently tears up and keeps open streets without regard or provision for the public use thereof.

Such contradictory methods can only result in the charge against the company of hypocrisy. If the company is not going to be consistent in all of its dealings, it would be far better that the sales department should not profess a policy of courtesy and fair dealing. We writhe under the charge that the company is particularly gracious when securing a contract and indifferent and arbitrary when the customer is looking for a favor.

Departments' Relations to the Organization

In an organization of many departments each department is apt to consider itself the mainspring of the organization. From the salesman's point of view the sales department is the most important, hence the salesman interprets co-operation to be that the other departments shall do as the sales department wishes and directs. At the same time the production department, feeling its value, knows well that the sales department would be of no use without something to sell. The construction department concludes that without its work none of the others could operate, and it probably joins in with the sentiment that the sales department does not really amount to much any way, because the public must have service and if the sales department did not seek the customers the customers would perforce come to the company.

Time was when the construction department would turn back an order involving an extension of lines with the notation "Business not worth the cost of extension." The construction department did not know, as the sales department believed, that the very shabby building involved was the beginning of a prosperous industry; nor did the firm name represent to the construction department, as it did to the sales department, honest, intelligent men who were bound to succeed. The construction department, because not constantly reminded in its daily dealings with the public, had forgotten that an inherent factor in the company's existence is that "the company *must* meet all reasonable demands of its public." The same department more recently was unable to see why its schedule of work for several days should be disarranged in order to give service in twenty-four hours to a plant where the steam engine had broken down. The work involved the construction of three blocks of primary line, the hanging of a heavy transformer and the securing of crossing waivers from two railroads. The construction department did not appreciate that such a demonstration of the company's ability to serve would gain a good customer and displace a steam plant that the sales department had been endeavoring for three years to shut down.

Mutual Understanding Between Staffs

If the sales department has authority to insist that work shall be done, and done promptly, even though it does not meet the approval of the construction department, the public is served. But this is not enough. Satisfactory co-operation is not attained by mere authority. Mutual understanding is needed. The understanding that now exists in the Detroit company between these departments was a matter of slow growth. Frequent conferences between the heads, and very frequent telling of the construction chief and his foremen of what the sales department hoped to accomplish in its work, have helped greatly. Authority, within certain limits, given to the sales department to decide without reference to the general manager as to whether or not an extension shall be made inspired some belief in the sales department.

But understanding, real co-operation from the construction department came after two assistant superintendents had been detailed to report jointly to both the sales department and the superintendent of construction. One of these men is responsible for the maintenance of motor-service lines and transformers and is in close touch with the motor-service salesmen and the customers they are dealing with. The other superintends service connections made on sales department orders, and on call of the sales department makes directly for it estimates of cost of extensions. Reporting thus to the sales department and absorbing its spirit of "increasing business" gives him a commercial point of view that he would not acquire as an operating foreman.

Responsibilities of the Sales Department

That these two departments now work remarkably well together does not mean that the sales department itself has not had to learn a few things. We know that it serves neither good service nor economy to insist on rushing a piece of work merely to make a spectacular showing to some customer, and we know that every time we break into the regular progress of the work by asking for emergency service we are not only increasing the expense but we are delaying service to other customers. We know that if we are to get the best service we must give the construction department early notice of work to be done. Our salesmen secure their contracts as early as possible. If there is delay in signing the contract, the construction department is notified in advance that a rush order will come in later for the given piece of work.

Allowing Customers Credit Standing

In the matter of credits the sales department also wears the scars of battle. The credit department, being closely allied with accounting, has a tendency to set up precise rulings that are sometimes difficult to enforce when the human factor is introduced. We must agree that when a man fails to pay his bills it is foolish to allow further charges to accrue. But while recognizing these rules as reasonable in general, we meet serious difficulty if they are applied without discretion. We have found that many a man whose past record would not entitle him to credit has started afresh and been a profitable customer. According to credit-department ethics, a poor record of payment of bills does not entitle a customer to a fresh start without security; but sometimes this same security would be the deciding factor as to whether or not the customer shall use our service. A credit department, because it is not in immediate touch with the outside conditions, does not sense the possibility of success or failure in an enterprise as the sales department does.

In Detroit the sales department has the authority of deciding the initial credit of a customer, but it never, no matter how tempting the business, extends credit to one who has previously made unnecessary trouble or shown a disposition to be dishonest. This solution has not only obviated the friction between these departments, but the sales staff has succeeded where the credit men failed in collecting doubtful and stubborn accounts, besides still holding the business and good-will of the customer.

Absorption of Meter-Installation Staff

The Detroit sales department long ago absorbed the meter-installation department solely in order that its ideas of prompt service might be met, and it has never since had

reason to doubt the wisdom of the absorption. The meter division is just as thoroughly imbued with the spirit of good and prompt public service as is the sales department proper.

The department that primarily meets the public, it seems, must make its contact as broad as possible and should be the truest and most complete expression of the company's policy and ability. To be such an expression it must understand the desires and difficulties of all the other departments. It must speak with one voice, not with many voices. And in taking to itself this business of direct dealing with the public the sales department has realized that while it may be "the voice of the company," it must, like the good ship *Dimbula,* speak as one voice for every part of the ship.

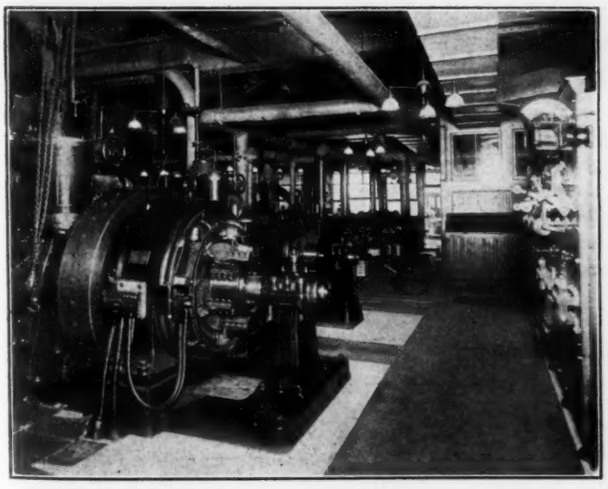
Saving Soles with Electric Irons

The young woman who has charge of window displays for a Louisville central station recently utilized a couple of pairs of women's shoes as an effective argument for electric irons. On one side of the window she placed an old-style sadiron and below it a well-worn pair of women's boots, run down at the heel and in dire need of resoling. In contrast, on the other side of the display was the cleanly and shining electric iron, accompanied by a trim pair of shoes which bespoke the ease and convenience of electric service. To the many women who passed the window this mute display offered its own feminine appeal.

Central-Station Service for Brooklyn (N. Y.) Post Office

A contract recently taken by the Edison Electric Illuminating Company of Brooklyn, N. Y., possesses more than customary significance in that it indicates very clearly the marked trend of the times toward central-station service. The contract was made with the government for the exclusive supply of light, heat and motor service for the Brooklyn post office, in which a private plant had been operated for many years.

The equipment replaced consists of two 50-kw and one 75-kw generator, directly connected to standard upright automatic engines; two 12-in. by 20-in. duplex steam-driven



INDIVIDUAL PLANT OF BROOKLYN POST OFFICE

air compressors, and one 14-in. by 18-in. duplex air compressor.

The Brooklyn post office building itself covers nearly an entire city block.

Negotiations preliminary to signing this contract covered a period of more than one year. Tests made during that time convinced the Treasury Department, which has jurisdiction in the matter, that it was more economical in Brooklyn to purchase electric energy for lighting, motor service and steam, than to generate it.

Illumination and Wiring

Night Illumination of Swimming Pool

The excellent night illumination of the Delmar swimming pool in Delmar Garden, St. Louis, as planned and carried out by the Electric Company of Missouri, is illustrated herewith. The St. Louis "white way" lamp, which has met

ILLUMINATION OF SWIMMING POOL

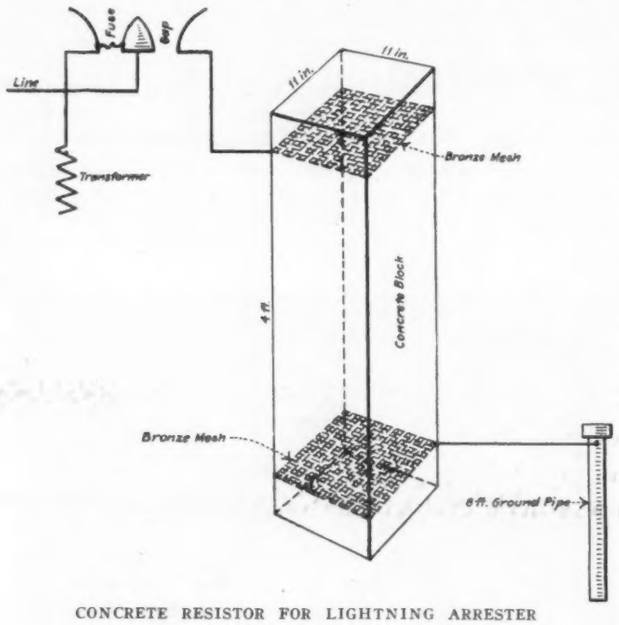
with much success at the hands of the electric-service men of that city, is used with good effect. Five cables suspended over the pool each support five 500-watt tungsten lamps, as shown. The tower in the center of the basin supports two additional lamps of the same size attached to a cross-arm. One-quarter-inch standard guy wire is used for the suspension cables. The cable-suspended lamps are spaced at equidistant intervals, and the lamps may be lowered easily for renewals. However, the present installation was made in May, and no renewals had been necessary up to Aug. 20. No. 8 wire is used for the lamp circuits, which are fed from three No. 4 secondaries.

Before the present system was installed both flame-arc lamps and tungsten clusters were installed to light this pool, but it is reported that the single-unit "white way" lamps now in use have given results more satisfactory to the proprietors of the resort. As this swimming pool is very popular during the summer, the "white way" lamps have received a great deal of attention, and much favorable comment upon them has been heard.

Concrete Resistors for Lightning Arresters

Concrete resistors for lightning-arrester service which are in general use on the 11,000-volt and 22,000-volt systems of a Georgia central-station company are illustrated in the accompanying sketch. Into a solid concrete block measuring approximately 4 ft. long and 1 ft. on a side are cast two squares of bronze or copper mesh, one near each end. The block is then stood upright at the point of installation, being set a few inches into the earth to insure it against accidental overturning. To the upper-mesh electrode is connected the tap from the middle member of the double horn-gap, the circuit through to the transformer or other station apparatus being completed by a piece of copper-

wire fuse, as shown. The lower-mesh electrode embedded in the block is similarly connected to a couple of 8-ft. ground pipes or ground rods driven deep into the soil. While the circuits are also adequately protected on the low-tension side, the fuse shown is especially provided for



CONCRETE RESISTOR FOR LIGHTNING ARRESTER

protection to the high-tension line. The copper-wire link used is designed to give four times the full-load carrying capacity, and each lineman carries in his pocket notebook a table of sizes suitable for the various installation ratings at both 11,000 volts and 22,000 volts.

Wiring of the Continental and Commercial Bank Building

Nearly all the interior conduits for the Continental and Commercial National Bank Building in Chicago have now been installed. Since the publication of the article describing the electrical wiring and illumination of this large building in the *Electrical World* of July 26 last, the rating of the feeder cables for the tenants has been materially increased, and it may be of interest to give the sizes of cables as finally decided upon. There are four main wire shafts, which may be designated as shafts A, B, C and D.

In shaft A, for tenants, there will be three 900,000-circ. mil cables incased in three 2-in. conduits, supplying the seventeenth, eighteenth, nineteenth and twentieth floors; three 900,000-circ. mil cables in 2-in. conduits supplying the floors from the twelfth to the sixteenth inclusive; three 1,000,000-circ. mil cables in the same size conduit, supplying the sixth to the eleventh floors, inclusive. The second, fourth and fifth floors will be supplied by three 650,000-circ. mil cables in three 2-in. conduits. The space from the sub-basement to the third mezzanine floor will be supplied by means of three 350,000-circ. mil cables in three 1.25-in. conduits.

The building-service feeders in shaft A, from the sub-basement to the third mezzanine floor, will consist of three No. 4 wires in one 1.25-in. conduit, in addition to three 400,000-circ. mil cables feeding into all floors from the second to the penthouse on the roof and incased in three 1.25-in. conduits.

The tenants' feeders in shaft B will be as follows: Supplying floors from the seventeenth to the roof, three 900,000-circ. mil feeders in three 2-in. conduits; supplying floors from the twelfth to the sixteenth inclusive, three 900,000-circ. mil feeders in three 2-in. conduits; supplying floors from the sixth to the eleventh inclusive, three 850,000-circ. mil cables placed in three 2-in. conduits; supplying the second, fourth and fifth floors, three 600,000-circ. mil feeders in three 1.25-in. conduits; supplying floors from the sub-basement to the third mezzanine, three 450,000-circ. mil cables in three 1.5-in. conduits.

In shaft B for public uses there will be three No. 4 wires in one 1.25-in. conduit, feeding into floors from the sub-basement to the third mezzanine floor. In addition there will be three 550,000-circ. mil cables in three 1.5-in. conduits, feeding into all floors from the second floor to the roof.

Tenants' feeders in shaft C will consist of three 900,000-circ. mil cables in three 2-in. conduits, supplying the seventeenth and upper floors; three 900,000-circ. mil cables in three 2-in. conduits, supplying the twelfth to the sixteenth floor inclusive; three 1,000,000-circ. mil cables incased in three 2-in. conduits, supplying the sixth to the eleventh floor inclusive; three 650,000-circ. mil cables in three 2-in. conduits, supplying the second, fourth and fifth floors. For the tenants in the portion of the building served by this shaft from the sub-basement to the third mezzanine floor there will be three 450,000-circ. mil cables in three 1.5-in. conduits.

Building service in shaft C will be supplied by three No. 2 wires in one 1.5-in. conduit, feeding floors from the sub-basement to the third mezzanine floor, in addition to three 450,000-circ. mil cables in three 1.5-in. conduits, feeding the second floor and floors above to the roof.

In shaft D the tenants' service will be supplied by three 900,000-circ. mil cables in three 2-in. conduits, supplying the seventeenth floor and floors above; three 1,000,000-circ. mil cables in three 2-in. conduits, supplying the twelfth to the sixteenth floor inclusive; three 1,000,000-circ. mil cables in three 2-in. conduits, supplying the sixth to the eleventh floor inclusive; three 750,000-circ. mil cables in three 2-in. conduits, supplying the second, fourth and fifth floors; three 450,000-circ. mil cables in three 1.5-in. conduits, supplying space from the sub-basement to the third mezzanine floor.

The public wiring in shaft D will consist of three No. 2 wires in one 1.5-in. conduit, supplying the space from the sub-basement to the third mezzanine floor, and three 450,000-circ. mil cables in three 1.5-in. conduits, supplying all floors from the second floor to the penthouse on the roof.

In addition to this wiring there will be two 500,000-circ. mil cables in two 1.5-in. conduits, supplying the fans in the attic on the twenty-first floor. On the fourteenth floor there are two elevator distributing panels, and for each of these there will be two 1,400,000-circ. mil feeders in two 2.5-in. conduits. In the penthouse on the roof there are also two elevator distributing panels. One of these will be supplied by two 1,400,000-circ. mil cables in two 2.5-in. conduits, and the other by two 1,500,000-circ. mil feeders in two 2.5-in. conduits. The private elevator panel on the seventh floor will be supplied by two No. 0000 cables in one 2-in. conduit. On the sixth floor there are two panels controlling dumb-waiters, and each of these is supplied from two No. 4 wires in a 1.25-in. conduit.

Montgomery's 400 Electric Signs

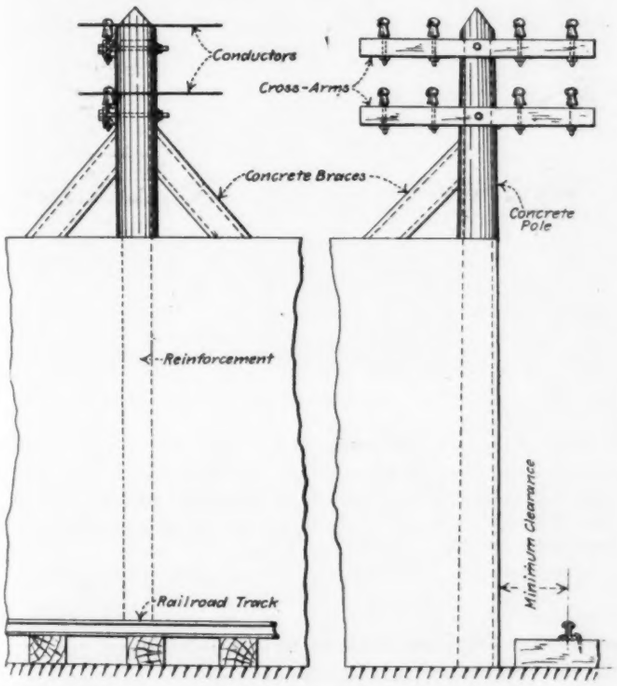
Four hundred electric signs are in operation on the streets and buildings of Montgomery, Ala., representing a connected load of about 550 kw. Most of the lamps are 20-watt carbons, so that in all more than 20,000 sign-lamps are in service, averaging about fifty lamps per sign. Montgomery's population is locally estimated at about 45,000. The Montgomery Light & Water Power Company and the Montgomery Light & Traction Company both offer low rates for sign and display lighting in that city.

Concrete Poles Integral with Building to Save Space

At the No. 3 plant of the Aluminum Company of America at Niagara Falls, N. Y., the problem of conserving real estate has been solved in one instance by resorting to a novel type of overhead-line construction. The motor-service wires reach the mill over a pole line and from the corner of the low concrete building which adjoins the main factory are carried by concrete poles constructed integral with the building.

As shown in the illustration herewith, the reinforcing extends up the wall of the building and continues to a point near the top of the pole. Braces of reinforced concrete are set on three sides of the poles at an angle of about 45 deg. The poles extend about 10 ft. above the roof, giving ample clearance between the wires on the lower cross-arm and the roof.

This arrangement has the further advantage of allowing



SIDE AND END VIEW OF CONCRETE POLES BUILT INTEGRAL WITH FACTORY

the spur track which is shown beside the wall to be placed closer to the factory than would have been possible if wooden poles had been set in the earth near the building. Thus in loading and unloading cars the distance between the car door and the sill of the factory entrance is reduced to a few inches.

Recent Telephone Patents

Telephone Time System

Mr. W. Pothen, of Murdock, Minn., has invented an arrangement whereby the hours may be struck on the telephone bells of all idle stations of an exchange. The striking part of a clock controls the connections.

New Apparatus

The prepayment coin-operated telephone has brought out some criticism on the ground that in cases of emergency the delay in finding a coin may be prohibitive. To obviate such a difficulty Mr. A. U. Gerber, of Chicago, has invented an emergency call attachment for such coin devices. An emergency button is provided which not only initiates a call without requiring a coin to be deposited but each such emergency use is registered upon a counter, and when the prescribed number of calls has been made the device locks itself against further use.

Mr. E. H. Martin, of Webster City, Ia., is the inventor of a message register which is contained within the shell of the ordinary receiver. A spring furnishes the motive

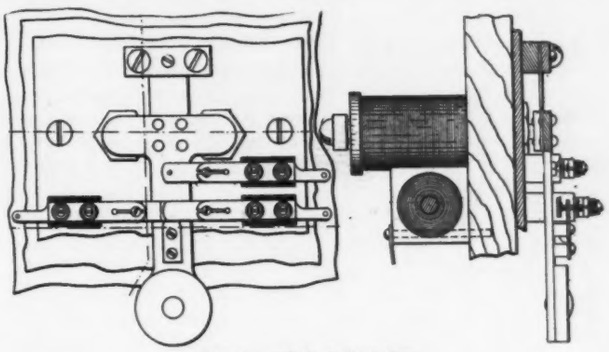


FIG. 1—POLE CHANGER

power and the spring must be kept wound or the receiver circuit will be open. A push-button serves to release the counter mechanism, the counter figures appearing through a window in the receiver casing.

Mr. A. H. Weiss, of Chicago; has obtained a patent on a pole changer for harmonic operation. This patent has been assigned to the Kellogg Switchboard & Supply Company. The main features are in the detailed design. A spring reed, properly weighted, constitutes the moving part. This reed carries a contact which controls the energy supply to the operating magnets in the field of which its armature is exposed. The main pole-changing contacts are placed on either side of the reed and are driven by a contact finger secured to it. The spring members are made very light but their motions are limited by auxiliary stiff members associated with them. Fig. 1 shows the arrangement.

Mr. P. T. Hudson, of Everton, Mo., has patented a circuit-breaker for protection from abnormal currents. Included in the circuit is a coil the magnetic field from which acts upon contact springs in such a manner that if the field becomes too strong the sensitive apparatus is disconnected, the line being grounded through the coil. This condition is maintained until the field weakens, at which time everything becomes normal. The illustration (Fig. 2) shows a neat method of combining the key mounting and key execution plate in one piece. This mounting is made in a long strip, as many sets of key springs and handles being mounted as desired.

Mr. C. A. Bals, of Chicago, has obtained a patent for a circuit system the feature of which seems to be the preven-

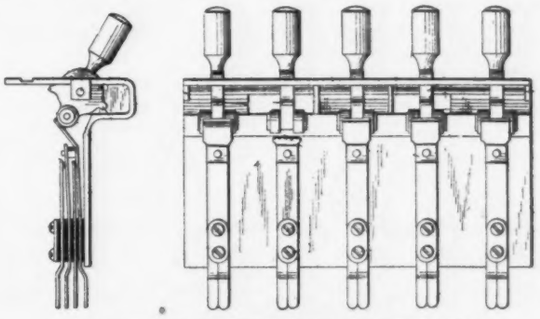


FIG. 2—KEY CONSTRUCTION AND SUPPORT

tion of listening on the part of the operator. A control relay is arranged so that if both parties to a conversation are on the line the relay is de-energized, thereby cutting off the operator's circuit. If two cords are used, the combined resistance is low enough to permit the action of a second relay, which also cuts off the operator's set.

A second patent granted to Mr. Bals, which like the preceding one is assigned to the Corwin Telephone Manufacturing Company, relates to a mutual arrangement of two related exchanges such as a central station and a private branch exchange. The patent covers a means for disconnecting one battery circuit when the exchanges are connected together so that one battery may serve both.

The invention of Mr. A. M. Beeler, of Seattle, Wash., refers to a group of party-line telephones for which a mutual busy signal is desired. He provides special mountings to be clamped to the telephone instrument so that a miniature lamp will glow upon each subscriber set if any one set of the group is in use. The switch hook in its up position closes the lamp contact.

In some systems signaling the exchange depends upon a momentary contact during transmission of the hook lever from top to bottom of its throw. Mr. A. C. Reid, of Genoa, Ill., has designed a set of contacts for a desk telephone with this point particularly in view. The temporary contacts are equipped with a latch device which causes distinctive action and records the direction of motion of the hook. This patent has been assigned to the Cracraft Leich Electric Company.

Letters to the Editors

Strength of Transmission Towers

To the Editors of the Electrical World:

Sirs:—Referring to the article by Mr. K. Nogami in your issue of Aug. 9 and to Mr. J. B. Leeper's comments thereon, Aug. 30, the writer extends to Mr. Leeper a hearty welcome into the ranks of those who are periodically protesting against certain practices in the design of transmission structures. There are two very common faults in tower design, and they are closely related. One is the optimistic (or fatalistic?) assumption of a totally erroneous safety factor, and the other the use of compression members having an improper ratio of l/r. As stated by Mr. Leeper, the critical condition is that of the compression members. He might perhaps have claimed with accuracy that no such structure has ever failed in its tension members, whereas the writer has in mind several failures in compression. It would tend toward a more accurate general understanding of the matter if those designers who are not perhaps structural experts would consider the ultimate strength of steel as being 20,000 lb. instead of 60,000 lb. per sq. in. If this condition is assumed, subsequent statements in regard to the factor of safety will have some basis of fact.

In the particular member under discussion—a 4-in. by 4-in. by 0.75-in. angle—the value of l/r for a length of 13 ft. is 202, an excessive amount for a main compression member. In order to show more clearly the effect of this factor, the approximate breaking strengths of several members of different size and length are given in the accompanying table.

TABLE I—DATA ON BREAKING STRENGTHS

Section	Area, Sq. In.	Length, Ft.	l/r	Breaking Strength, Lb. per Sq. In.	Total Breaking Strength, Lb.
4-in. by 4-in. by ¾-in. angle....	5.44	13	202	12,000	65,200
5-in. by 5-in. by ⅞-in. angle...	5.31	13	159	16,000	85,000
6-in. by 6-in. by ⅞-in. angle...	5.06	13	131	20,000	101,200

From the table it is evident that a 6-in. by 6-in. by 7/16-in. angle having a much smaller value of l/r would have been stiffer, stronger and lighter than the section used and would therefore have been a better and more economical member. It may further be noted that the 4-in. by 4-in. by 0.75-in. angle member has a minus factor of safety instead of 3.4.

In general it may be stated that many towers of the windmill type, as well as certain types of frames and poles, are faulty in the design of their compression members. This condition is chargeable to competitive bidding and the prevalence of the custom of expending most of the available appropriation on the power house, leaving the line to work out its own salvation.

There has been some attempt upon the part of purchasers to protect themselves as it were from their own ignorance by making a full-size test of a tower. To the writer's mind this is a confession in avoidance, as it should not be necessary for a competent engineer to test a statically determinate structure, and in addition the result is not an absolute guarantee of the performance of the subsequently erected towers. A long slender unsupported angle is not well adapted to withstand compression, and any injury in handling which produces a slight bend will greatly reduce the theoretical strength.

Lest the writer be accused of undue alarm as to the prevalence of this practice, he gives a table of sections from the last design illustrated in your columns.

TABLE II—DATA ON SECTIONS

	Area, Sq. In.	Approximate Length, Ft.	l/r
2½-in. by 2½-in. by ⅜-in. angle.....	1.01	11	236
2-in. by 2-in. by ⅜-in. angle.....	0.72	7	210
2-in. by 1½-in. by ⅜-in. angle.....	0.63	10	375

In all seriousness, is it not about time for the transmission line to receive some fraction of the careful and expert attention now given unquestioningly to the other portions of a transmission installation?

It would appear self-evident that the pole or tower line which carries the product of the power house to the customer, and which is neither under cover nor under constant supervision, is an extremely important factor in maintaining uninterrupted service.

New York. R. D. Coombs.

A New Notion in Ventilation

To the Editors of the Electrical World:

Sirs:—It appears from the editorial entitled "A New Notion in Ventilation" in your issue of Aug. 9 that the true status of ozone in ventilation is beginning to be appreciated. It has substantially been established that the only dangers of vitiated air are due to excess of heat and moisture and to odors. The latter arise from respiration and surface excreta of those present and are due to organic impurities, which, while probably not poisonous in the ordinary acceptation of the term, nevertheless constitute an important factor in the unsuitability of stale air. They cause shallow breathing, anorexia and general lowering of the vitality, with consequent loss of efficiency. Ozone has been shown capable of chemically metamorphosing these odors, and thus its use is both logical and hygienic.

The liability to nitrous-oxide formation in commercial types of ozonators has been greatly exaggerated. One of the worst offenders in this respect, a machine which I examined recently, gave a concentration of only 24 parts of nitrous acid in 100,000,000 volumes of air, so that a person would inhale approximately 2.7 milligrams in twenty-four hours. It is needless to point out that this transcends even homeopathic dilutions and the physiological effect is scarcely even conjectural. Properly constructed ozone generators give amounts of nitrogen oxide which are at most infinitely smaller than those found in the atmosphere after thunderstorms.

Bloomfield, N. J. Milton W. Franklin.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Iron-Pipe Construction in Distribution Rack

The general rehabilitation which is now taking place at the plant of the Elwood (Ind.) Electric Light Company has been extended to include the distribution rack which carries the outgoing lines for local lighting and motor service.

DISTRIBUTION RACK MADE OF IRON PIPE

The feature of this rack reconstruction has been the use of 3-in. iron pipes with porcelain insulators fastened between them by means of bolts, giving to the finished structure a neat appearance combined with a degree of stability and endurance not possible to obtain by the use of wooden supports. Wires are brought out from the insulators in the wall of the station to the two lower pipes and are there dead-ended. Jumper wires are thence run to the insulators suspended from the pipe above and after making a right-angle turn at this point are taken to the lead which they are to supply.

Throughout the installation white, brown, blue and yellow insulators have been used to distinguish respectively primary circuits, secondary circuits, arc-lamp circuits and grounded wires so that a man working on the rack has little trouble in distinguishing the several classes of lines.

Cleaning of Oil Fuel

By R. T. Strohm

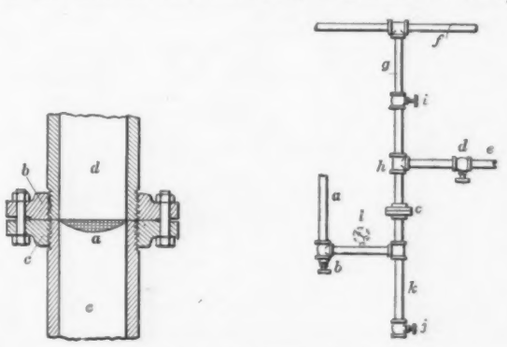
The greater number of burners for oil fuel are constructed with small orifices through which the oil is sprayed. It therefore becomes necessary to take proper precautions to prevent the burners from becoming clogged by particles of sand or other foreign matter. The dirt found in the oil may be in the crude oil as it comes from the well, or it may find its way in during the subsequent transportation and handling of the oil. Oil wells are driven through strata of various earthy materials to pierce the oil-bearing sands, and as a consequence the crude oil issuing from a well contains more or less sand. If the crude oil is used directly as a boiler fuel, it must be strained; otherwise the particles of sand will clog the burners and render them erratic in their operation. The heavier and more viscous the oil, the more easily will it hold and carry with it particles of sand and dirt.

A common method of separating dirt held in suspension in liquids of smaller specific gravity is that of sedimentation or settling. Thus, if oil fuel containing dirt is run into storage reservoirs or settling tanks and there allowed to remain undisturbed for some time, much of the heavier sediment will fall to the bottom by reason of its own greater density. The cleaned oil may then be drawn off at the top. However, this method involves storage of the oil for a time, with the consequent expense of tanks and pumping machinery; moreover, if the oil is very heavy and viscous, it is by no means certain that the settling method will result in thorough cleaning. It is therefore a wise precaution to use strainers in the piping system that conveys the oil to the burners.

Even the heat treatment or partial distillation that results in the formation of fuel oil cannot be relied on to produce a clean oil; so, where fuel oil is used, strainers should be installed. They not only prevent clogging, but they also lessen the wear on the burner tips due to the erosive effect of grit.

The material of which the strainer is made may be wire netting, gauze or perforated metal. In any case, the meshes or openings should be only about half as wide as the smallest passage or orifice in the burner. Brass wire gauze is the material commonly used, although good strong mosquito netting may be bent into shape to form a strainer. On account of the comparatively large openings in mosquito netting, it should be used only in connection with burners that have no minute orifices, as, for example, the Best burner.

The simplest form of strainer, shown in Fig. 1, consists of a circular piece of wire gauze *a* held between a pair of pipe flanges *b* and *c;* but the simplicity and cheapness of this form are its only commendable features. The oil flowing from the pipe *d* to the pipe *e* on its way to the burners will deposit the sand and dirt on the gauze, and sooner or later the latter will become choked, because it has so small an area. In this condition it will seriously obstruct the flow of oil; therefore, a strainer of this kind

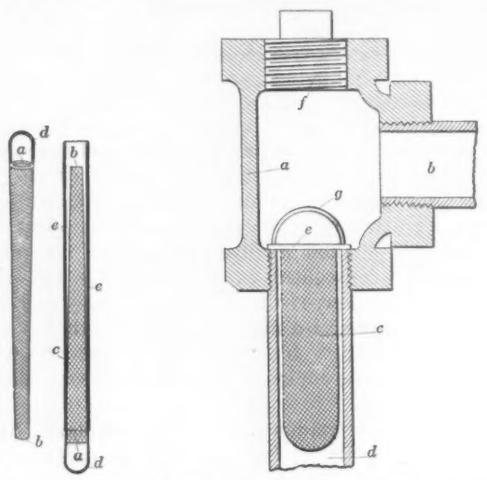


FIGS. 1 AND 2—SINGLE OIL STRAINER AND PIPE CONNECTIONS FOR STRAINER

would have to be cleaned frequently. Each cleaning would necessitate opening up the joint at the flanges, so that the gauze could be taken out, and before this could be done it would be necessary to shut off the flow of oil. This type of strainer, therefore, is to be avoided in the simple form shown.

The arrangement of piping shown in Fig. 2 does away

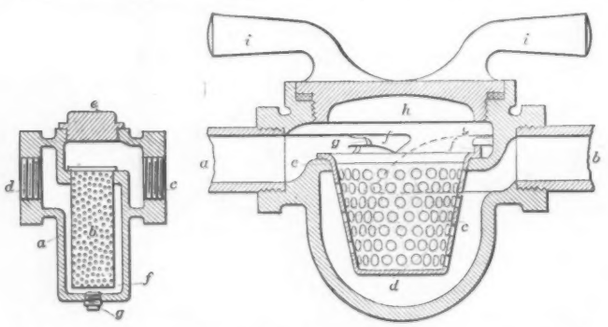
with the objectionable feature of breaking the joint to clean the strainer. The oil from the pump flows through the pipe *a* and the valve *b* and passes upward through the wire gauze held between the flanges at *c*, continuing on its way to the burners through the valve *d* and the pipe *e*. The steam line *f* to the burners has a branch *g* that is joined by the tee *h* to the oil line and is fitted with a valve *i*.



FIGS. 3 AND 4—WIRE-GAUZE STRAINER AND T FITTING USED FOR STRAINER

Below the strainer the oil pipe is extended and fitted with a valve *j*. When the burners are working, the valves *i* and *j* are closed and the valves *b* and *d* are open. When the strainer becomes clogged and requires cleaning, the valves *b* and *d* are closed and a bucket is placed under the valve *j*, which is then opened. Finally, the valve *i* is slowly opened, admitting live steam above the strainer, and this steam, rushing downward through the gauze, will clean it and blow out all the dirt collected beneath it. The valves are then set again for normal working. The valve *i* must be tight or condensed steam will leak into the oil and cause the burners to sputter. The nipples should be fairly long, to form a trap for water and dirt. A pressure gage, shown dotted at *l*, may be attached to the oil pipe on the pump side of the strainer. An abnormal rise of pressure shown on it will indicate that the strainer is clogged and in need of cleaning.

The requirements of a good oil strainer are that it shall stop and hold the solid foreign matter entrained with the oil; that it shall have ample straining surface, so that cleaning may not be required too frequently, and that it shall be constructed and installed so that the cleaning may be quickly and easily done.



FIGS. 5 AND 6—PERFORATED METAL OIL STRAINER AND BASKET STRAINER FOR RAPID WORK

The strainer shown in Fig. 3 is made of wire gauze bent into the form of a conical frustum, with the large end *a* open and the small end *b* closed. This form is inserted in the open end of the suction pipe *c* leading to the oil pump and provides a large area through which the oil may pass on its way to the pump. An advantage of having the strainer at this point is that it removes much of the grit that would otherwise cause wear of the pump barrel and plunger. The large end *a* is made slightly larger than the diameter of the suction pipe. The strainer is simply pressed into place in the pipe and is held there by friction and by the suction effect of the pump. A bail or loop *d* is fastened to the large end so that the strainer may easily be withdrawn when it must be cleaned. The tapering form allows ample space around the strainer, as at *e*, for the oil after it has passed through the gauze.

A T fitting may be used to form a simple and inexpensive strainer, as shown in Fig. 4. The fitting *a* is inserted at a right-angled turn in the oil piping, and the oil, entering through the pipe *b*, passes through the strainer *c* and flows away through the pipe *d*. The strainer is cylindrical in shape and hangs in the pipe *d*, being supported by a ring *e* that rests on the upper end of the pipe. When the strainer requires cleaning, the plug *f* is removed and the strainer is lifted out by the bail *g*.

The type of strainer shown in Fig. 5 consists of a special casting *a* that is installed in the oil line and that contains the perforated metal cylinder *b* by which the actual straining is done. The oil enters at *c* and flows out at *d*. The cylinder *b* may easily be removed after the plug *e* is unscrewed; but, as in the case of the strainers previously shown, the flow of oil must be shut off during the cleaning operation. In order to reduce the period of stoppage to a minimum, it is advisable to have more than one perforated cylinder, so that a clean one can be inserted as soon as the dirty one is removed. Any dirt that passes through the strainer and settles in the bottom of the chamber *f* may be taken out through the hole closed by the plug *g*.

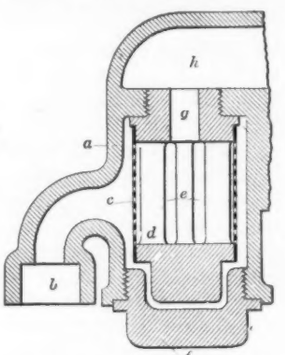


FIG. 7—KOERTING TYPE OF OIL STRAINER

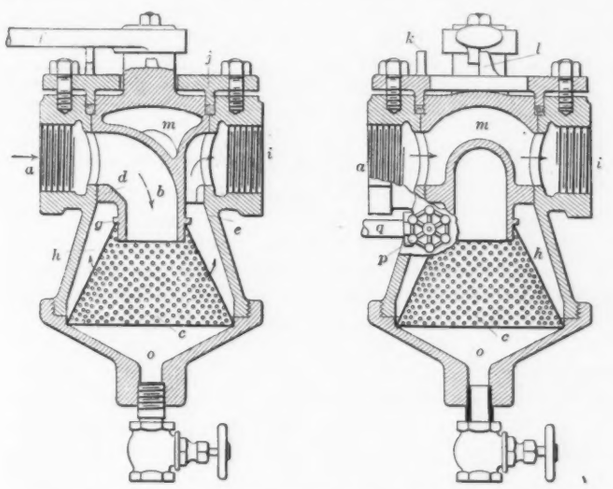
Rapidity in cleaning is the chief feature of the basket strainer shown in Fig. 6. The device is installed in a horizontal section of the oil-pipe line, and the oil flows through from *a* to *b*, being thus forced to pass through the strainer *c*, which consists of a metal basket closed at the bottom, perforated on the sides with large holes, and lined with closely fitting wire gauze *d*. The gauze does the straining and the metal basket simply holds the gauze and prevents it from being torn. If the gauze were not supported and it became clogged, the resistance it would offer to the passage of the oil might cause it to be torn. The basket has a rim that rests on the seat *e* and the inclined ribs *f* on the rim are locked firmly under the lugs *g* by giving the basket a part of a turn. The screw-down cover *h* has a pair of handles *i* by which it may be unscrewed quickly and lifted off, after which the basket is given a twist to unlock it and is then removed. Packing under the flange of the cover prevents leakage of oil.

Sometimes the strainer is located in the same casting with the burner, as in the Koerting type, shown in Fig. 7. The casting *a*, of which only a part is shown, contains a pair of burners, each of which is supplied with oil from an

oil inlet *b* through a perforated metal strainer *c*. The strainer is cylindrical and fits snugly over a cylindrical hollow cage *d* that has several long slots *e* in the sides. The cage is screwed into the casting *a*, being inserted through the opening made by removing the plug *f*. The oil from the inlet *b* surrounds the strainer, passes through it and the slots to the interior of the cage, and then flows through the opening *g* to the chamber *h*, which leads to the burner. As each strainer serves its own burner and the two are separate, it is possible to shut down one burner and remove its strainer without affecting the operation of the other burner. On restarting after inserting a clean strainer, the burner that remained working will ignite the fresh spray of fuel from the other burner. This arrangement enables the strainers to be cleaned wthout completely interrupting the operation of the burners.

Of course, the same object could be accomplished by installing a pair of strainers of any type, with the valves and piping so arranged that while one was out of service for cleaning or repair, the oil could be sent through the other.

A special type of strainer is illustrated in Figs. 8 and 9, which show two different positions of the same device. Corresponding parts in both views are therefore marked with the same reference letters. The important feature of this strainer is that it can be cleaned without taking it



FIGS. 8 AND 9—TWO VIEWS OF STRAINER ARRANGED FOR CLEANING WITHOUT REMOVAL

apart and without interrupting the flow of oil. Fig. 8 shows a section of the strainer in its normal working position. The oil flows in at *a* and is directed downward by the curved passage *b* into the interior of the conical perforated strainer *c*. The passage *b* is formed in a tapering plug *d* that fits closely in the body *e* of the device, and this plug may be rotated by means of the handle *f*. The strainer *c* is held down firmly by the collar *g* on the lower end of the plug. The oil, after passing through the cone into the surrounding chamber *h*, flows upward and out at *i*. The plug is held in place by the pressure of the plate *j* bolted to the body *e*, and packing is inserted at the joint to prevent leakage of oil. The handle *f* has on its under side a lug that comes against one or the other of the lugs *k* and *l* set 90 deg. apart on the plate *j*. These limit the rotation of the handle, and consequently of the plug, to a quarter-turn.

When the strainer becomes so dirty as to require cleaning, the handle *f* is given a quarter-turn, which brings the plug into the position shown in Fig. 9. There is a second passage *m* at right angles to the passage *b*, and when the plug is turned the oil flows directly from the inlet to the outlet, without passing through the strainer. Next, the blow-out valve *n* at the bottom of the chamber *o* is opened, after a bucket is set under it. Then the valve *p* is opened, admitting live steam to the chamber *h* from the supply pipe *q*. The steam rushes through the cone in a direction opposite to that in which the oil flows and loosens the dirt, which falls to the bottom of the chamber *o*. It is then blown out through the valve. By the use of this strainer there is no interruption of the oil supply and unstrained oil is sent to the burners only during the brief time required to blow out the dirt. The handle *f* is then swung back to its first position and the strainer resumes its normal working.

Plant Extensions at Amesbury, Mass.

The Amesbury (Mass.) Electric Light Company has recently acquired rights in connection with the supply of electricity to a considerable summer population in the Salisbury Beach district and has purchased and enlarged the existing distribution system in that locality, which was formerly operated by several associates controlling an old steam plant. Negotiations have been under way for the sale of electricity to the municipal lighting plant in the town of Merrimac and the shutting down of the latter, and in the company's immediate territory many contracts have been secured for lighting and power service. The company is increasing the capacity of its generating plant by the addition of a 1000-kw steam-turbine unit with the necessary boiler capacity, condensing equipment and auxiliary apparatus. The estimated cost of the new work, based on bids received and previous experience in the enlargement of the plant, is as follows:

ESTIMATED COST OF ENLARGING STATION AT AMESBURY, MASS., 1913, BY 1000 KW

Extension of power plant building	$9,122
Kellogg radial brick stack: height, 150 ft.; diameter at top, 6 ft.	3,585
Stack foundation	840
Piling, excavation, etc.	400
Turbine foundation, 10 ft. x 20 ft. x 14 ft.	1,200
Boiler foundation, 19 ft. x 26 ft. x 11 ft.	1,300
Excavation for suction piping, 2000 cu. yd. at 50 cents	1,000
Two 400-hp water-tube boilers, Babcock & Wilcox	9,781
Brickwork	1,500
Two superheaters	2,214
Two Taylor stokers	6,150
Boiler flue	800
Coal-handling cars and track	1,200
One 1000-kw horizontal Curtis turbine, 60 cycles, 2300 volts	13,200
One Westinghouse Le Blanc No. 8 condenser, capacity 20,500 lb. steam per hour, 28 in. vacuum turbo pumps, 70 deg. water	3,225
Piping	3,000
Feed pumps, heater, etc.	800
Pipe covering	1,000
Turbo-alternator switchboard	500
Erecting and wiring board and turbine	500
Incidentals, 10 per cent	6,132
Total	$67,449

The municipal generating plant at Merrimac is located in the town pumping station, but the installation will probably be shut down soon in view of the lower cost of central-station service.

Supporting Vertical Feeders

In supporting vertical feeders on interior construction what distance between feeder supports is accepted as good practice? M. E. T.

Conductors in vertical conduit risers must be supported within the conduit system in accordance with the following rules, taken from the National Electrical Code: Nos. 14 to 0, every 100 ft.; Nos. 00 to 0000, every 80 ft.; No. 0000 to 350,000-circ. mil, every 60 ft.; 350,000-circ. mil to 500,000-circ. mil, every 50 ft.; 500,000-circ. mil to 750,000-circ. mil, every 40 ft.; 750,000-circ. mil, every 35 ft.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Mercury-Arc Rectifier.—Harry F. Perkins.—A fully illustrated article on a recent form of iron tube which is used in place of glass in the development of the rectifier for high power, and which has been reduced by the General Electric Company to an extremely simple and stable state. A rectifier of the three-phase, three-arm type is shown in Fig. 1, and the wiring connections in Fig. 2. A bank of three delta-connected standard transformers step the line potential of 2200 volts, 60 cycles, down to 236 volts, which is applied to compensators connected in Y to give a neutral point, which is the negative side of the direct-current circuit. The compensators also allow of voltage variation by means of taps. Close voltage regulation may be obtained by varying the tap connection one phase at a time. The slight unbalancing of phases thus produced does not affect the rectifier in the least. Each battery being charged has a standard charging rheostat in series which gives the desired individual control. This gives to the rectifier all the regulation qualities of a direct-current generator, without the rheostat losses. Very fine regulation can be obtained by using a standard induction regulator. A comparison is made between the efficiency of a motor-generator set and a rectifier. The latter maintains its efficiency at all loads and is free from loss when no current is taken. With rectifiers for higher voltages an efficiency of 97 per cent can be obtained. A set of oscillographs is given showing the wave-forms of the original and the rectified emfs and currents. The method of starting the rectifier is discussed, together with the necessity of ionization for starting. In the case of rectifiers supplying variable loads where the current may be off for short periods, as, for instance, when carrying a railway load, the carrying-over of the arc is accomplished by supplying the starting anode from a separate direct-current source, or by inserting two small auxiliary anodes which can form part of a separate rectifier circuit supplied by an additional coil from the main transformer, or by a separate small transformer. This auxiliary rectifier can be designed to consume a minimum current at low voltage and can thus be made self-sustaining with but small loss. In rectifiers carrying a steady load this carrying-over can be done to best advantage by placing in the direct-current circuit an air-gap reactance.

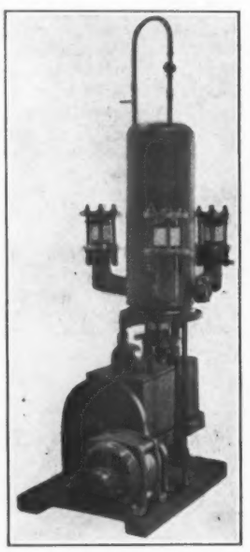
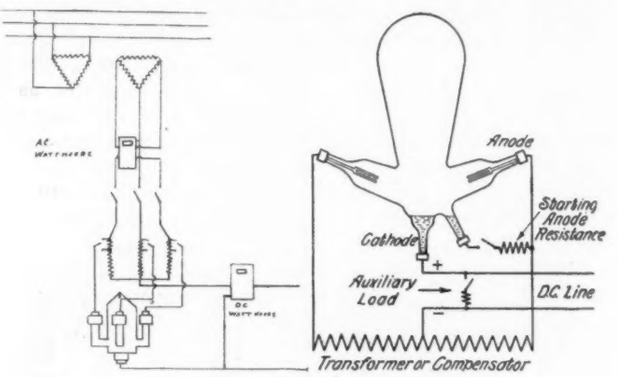


FIG. 1—THREE-PHASE THREE-ARM TYPE OF RECTIFIER

The main arc flows in one direction only when the cathode is excited and when the potential at the anode is positive with respect to the cathode, but no current will flow without excitation until a potential is reached that will cause a Geissler discharge, for the vacuum in these tubes is of a very high degree and it ordinarily would take several thousand volts to cause a discharge without a cathode spot. This is one reason why the current does not flow in both directions. Upon examination of the diagram (Fig. 3) it will be seen that current flows only in one-half of the transformer winding at a time, and the potential of the direct-current load is that of one-half of the average, not the effective (square root of the mean square) transformer voltage, minus the arc drop. As the



FIGS. 2 AND 3—DIAGRAMS OF CONNECTIONS

cathode is only separated from the working anode by the arc drop, we have practically all the potential of the transformer applied between the cathode and the idle anode, which is now negative with respect to the cathode. Many hundreds of these tubes are now in commercial service on circuits carrying over 10,000 volts. A particular application is found in their use for charging electric automobiles.—*Metall. and Chem. Eng'ing*, September, 1913.

Electrolytic Iron Sheets for Dynamo-Electric Machinery.—E. von Mauthner criticises the article of M. Breslauer (recently abstracted in the *Digest*) in which the use of pure electrolytic iron was claimed to be very promising for the construction of dynamo-electric machinery and transformers. Breslauer replies to this criticism.—*Elek. Zeit.*, Aug. 14, 1913.

Lamps and Lighting

Deposit Upon the Poles of Metallic Arcs.—W. G. Duffield.—An account of experiments with copper arcs, iron arcs, silver arcs, etc., concerning the peculiar tree-like growth which sometimes appears on one or the other electrode. For instance, in experiments with the copper arcs, under favorable conditions of current strength and arc-length, delicate tree-like structures rapidly grew from the negative pole in the direction of the anode, eventually bridging the gap and possibly assisting in the passage of the current. From the experiments made with arcs of different metals and under different conditions the author summarizes the outstanding features of these metallic growths as follows: their preference for the cathode, their formation upon a third electrode if it is of a potential sufficiently high and especially if it be negatively charged, their preference for a pointed electrode, their derivation from the material of either the anode or cathode, but chiefly from the latter, their organic form—tree-like, etc.—which is different for different metals, the rapidity of their development as they approach the anode and when an outburst of vapor occurs. The origin of these peculiar growths is discussed at con-

siderable length by the author.—*Philos. Magazine,* August, 1913.

Automobile Lighting.—JOSEF LOEWY.—An illustrated description of various systems of electric automobile lighting.—*Elek. u. Masch* (Vienna), July 27, 1913.

Railway Station Lighting.—Illustrated notes on modern railway station lighting in Germany, with special reference to the use of metallic-filament lamps.—London *Electrician,* Aug. 15, 1913.

Generation, Transmission and Distribution

Electric Power in Coal Mines.—S. F. SOPWITH.—A paper in abstract read before the South Staffordshire and Warwickshire Institute of Mining Engineers on the electrification of the Cannock Chase colliery. The generating plant consists of three direct-coupled steam alternators, two being of 200-kw and one of 500-kw capacity. Three-phase currents are generated at 3000 volts and 50 cycles. The total cost of power station and transmission lines is $106,000. The total number of kilowatt-hours produced during the first half year was 337,000 and the total cost per kilowatt-hour was 1.974 cents. The advantages derived from the adoption of electricity are summarized as follows: (1) The colliery consumption has been reduced by at least 1¼ per cent, say 6875 tons. (2) Some twenty-five horses have been dispensed with underground. (3) A great reduction in labor has resulted from the substitution of mechanical for horse haulage. (4) The Lancashire boilers no longer required (owing to the conversion of steam to electric power) are being utilized at other pits to supersede old egg-ended boilers, thereby reducing labor and consumption. (5) The energy is available underground for further extensions in the way of auxiliary haulage, coal cutting, etc., and for lighting up important stations, which, if not actually economical, is more convenient and safer. The actual total annual saving represents about 18½ per cent interest on the capital outlay.—London *Electrician,* Aug. 8, 1913.

Upper Silesia.—BÜGGELN.—An account of a recent excursion of a party of electrical engineers through the industrial district of Upper Silesia in Germany. Notes are given on the use of electric winding in mines, electric operation of rolling mills, and on the Chorzow and Zaborse power stations of the Upper Silesia electricity works. They generate three-phase currents at 6000 volts which are transmitted in underground cables. For the low-tension networks overhead wires are used. The generating capacity of the two stations is 57,600 kw. The connections have increased from 31,649 kw in 1911 to 45,455 kw in 1912; the kilowatt-hours sold have increased from 100,081 to 126,240. The extended use of reinforced concrete is mentioned.—*Elek. Zeit.,* Aug. 7, 1913.

Traction

Stray Currents from Railroads.—JOHANNES RAUTENKRANTZ.—An illustrated article on the problem of stray currents from railroads and the German regulations concerning them. The author describes the methods of Haber for measuring the voltages in the earth and the density of earth currents, Hering's method of measuring the current in the pipes, methods of measuring the resistance of the track and of the rail joints, and finally discusses means for avoiding damage due to earth currents.—*Elec. u. Masch.* (Vienna), Aug. 10, 1913.

Installations, Systems and Appliances

Holland.—J. A. SCHONTEN.—A map showing the location of the central stations in Holland. The most important transmission systems are Bloemendaal (763,000 kw-hr. sold in 1911), Leiden (1,471,000 kw-hr.), Staatsminen (6,378,000 kw-hr.) and Hengelo-Enschede (2,800,000 kw-hr.). The largest electric railway is the line from Rotterdam to The Hague and Scheveningen, which has its own power plant.—*Elek. Zeit.,* Aug. 7, 1913.

Electric Heating.—H. O. SWOBODA.—The concluding article of his serial on efficiency and cost of electric heating. A long table is given stating the rating of various commercial electric-heating devices.—*Elec. Journal,* July, 1913.

Wires, Wiring and Conduits

Calculation of Lines.—A. BLONDEL.—An article illustrated by numerous diagrams on the rapid calculation of overhead lines from a mechanical viewpoint. The author gives a résumé of the graphical methods which have been developed by him formerly and of the principles which have more recently led him to the development of the "logarithmic diagram." He finally makes some remarks on the method of Semenza. The article is to be concluded.—*La Lumière Elec.,* Aug. 9, 1913.

Electrophysics and Magnetism

Delta Rays.—H. A. BUMSTEAD.—An account of an experimental investigation. When aplha rays fall upon a metal electrons are emitted with velocities varying continuously from a very small value to more than 2.7×10^9 cm per second, which corresponds to a potential difference of 2000 volts. It is proposed to include under the name "delta rays" all the electrons which owe their origin to the direct action of the alpha rays—the swifter ones as well as the slower ones previously known. Evidence is given for the view that, in addition to the delta rays, positive ions are also produced when alpha rays impinge upon a metal in a very high vacuum. These ions appear to come from the layer of absorbed gas upon the metal. By maintaining the vacuum for several days the current carried by these ions may be reduced to a small value—from 5 to 10 per cent of that carried by the alpha rays themselves. The present experiments do not determine whether or not these ions leave the plate with an appreciable velocity in the absence of an electric field, but there is some evidence that the velocity is, at all events, small. When the swifter delta rays fall upon a solid it emits electrons of slow speed which, in the present paper, are referred to as tertiary electrons. Their number is considerably greater than the delta rays which produce them. The existence of the tertiary electrons makes it difficult to determine with accuracy the distribution in velocity of the delta rays. A large number of tertiary electrons come from the source of delta rays itself, and their presence in the beam of delta rays makes it impossible to draw valid conclusions as to the true number of delta electrons of slow speed (less than 10 or 20 volts). The distribution in velocity of the delta rays between 20 and 1200 volts has been determined.—*Philos. Magazine,* August, 1913.

Electrochemistry and Batteries

Carborundum Refractories.—F. J. TONE.—An article pointing out that carborundum is a material unique among refractories owing to the following distinguishing physical properties: High softening or decomposition point, high thermal conductvity, low coefficient of expansion, hardness of mechanical strength, resistance to acids and other chemical agents, comparatively low density. Carborundum refractories are now available in two different forms, one containing a vitrified or ceramic binder, the other consisting entirely of carborundum. The latter type is absolutely unattacked by acids and is inert to the influence of practically all other chemical agents. It is, however, extremely expensive to produce, and its use is limited to those places where the ordinary brand of carborundum refractory is not suitable. The vitrified carborundum refractory has, owing to its lower cost of production, a much wider application to the refractory industry. It consists of suitably chosen carborundum grains bonded with a special form of refractory clay, mixtures of grits and methods of molding being employed to insure a very dense body of low porosity.—*Metall. and Chem. Eng'ing,* September, 1913.

Units, Measurements, and Instruments

Testing Cable Networks.—B. ANDRAN.—In an article on exhibits at the recent annual exhibition of the French Physical Society mention is made of the difficulty of testing a cable network, since double the normal voltage is required for these tests. If alternating current is used for testing, the transformer giving double the normal voltage must have a rather high capacity in order to charge at each alteration the condenser formed by the cable. Delon and Picou have described methods of testing based on the use of direct current which are more convenient. On the other hand, André Leaute has devised a rather simple method in which alternating current is used. If a circuit (Fig. 4) comprises a self-induction L with resistance R and a capacity C and if an emf U is impressed on the circuit, then the emf U_1 between the terminals A and B of the condenser C will increase with increasing inductance L and will become a maximum if $(2\pi n)^2 LC = 1$ and this maximum of U_1 will be $2\pi n\, LU/R$. If $2\pi n\, L/R$ is made equal to 2 or greater than 2, this method (condition of resonance) gives the desired voltage for testing. The two conductors of the cable under test, or each of them and the armature, form a condenser, and if between the conductor and the source of testing current a self-induction cord of correct dimensions is inserted, the desired testing voltage is obtained in the cable. The advantages accruing from the utilization of this method are discussed at considerable length.—*La Lumière Elec.*, July 26, 1913.

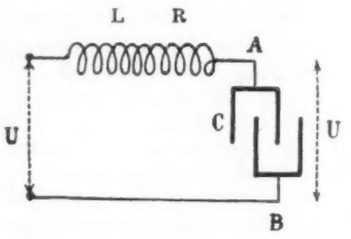


FIG. 4—CIRCUIT FOR TESTING CABLE NETWORKS

Watt-Hour Meters.—T. T. FITCH.—An abstract of a paper from the Bureau of Standards. This paper gives the results of numerous tests on six makes of American direct-current watt-hour meters. The discussion is given under three headings: performance data; details of construction; effect of friction losses. With respect to performance data, the load curve is shown to be a curve which when the ordinary adjustment of the meter is correct at 10 per cent and full load results in the meter being fast between 10 per cent and full load and slow at overloads. The meters showed a variation of from 1 to 8 per cent for a variation of voltage from 84 to 116 per cent of the normal. For three-wire meters the two current elements were found to differ from equality by from 0.4 to 4 per cent. The range of starting-coil adjustment at 10 per cent load varied from 4 to 22 per cent in rate of the meter for different makers. The range of the magnet adjustment varied from 35 to 155 per cent in change of the meter rate for the different makers. The meters were affected by short-circuit on 220 volts, as shown by changes in the rate of from 0 to 34 per cent. The back emf in the commutator meters at full load ranged from 0.07 to 0.19 volt and was about —0.1 per cent per deg. C., except for one meter which gave 0.25 per cent. The friction torques due to the bearings, the brushes, the gearing and the air were measured. The friction torques, with the exception of the air friction torque, are curvilinear functions of the speed. Finally the load curve of the commutator meter is analyzed and its curvature shown to depend on the back emf, the variation in the friction torque and the change in rate caused by heating of the series coils. The discussion has not been extended to the mercury-type meter in such a complete form as is the case with other types.—*Journal Franklin Inst.*, August, 1913.

Instrument Exhibition.—B. AUDRAN.—The conclusion of his illustrated description of exhibits at the recent exhibition of the French Physical Society. The Soulier rectifier, methods of testing networks, wireless telegraph apparatus and the high-speed Pollag-Virag printing telegraph are dealt with.—*La Lumière Elec.*, July 26, 1913.

Telegraphy, Telephony and Signals

Submarine Telephone Cables.—BELA GATI.—In the Thompson system of telephone-line construction with induction coils in shunt the induction coils are made of a high ohmic resistance. In contradistinction to this the author investigates a cable with induction coils in shunt if the resistance is comparatively low and compares this system with the Pupin system of induction coils in series and the Krarup system of continuous loading.—*La Lumière Elec.*, July 26, 1913.

Miscellaneous

Exhibition.—MAX GRUHN.—An illustrated article on electric exhibits at the International Architects' Exhibition in Leipzig, with special reference to lighting.—*Elek. Zeit.*, Aug. 14, 1913.

Book Review

PRACTICAL ALTERNATING CURRENTS AND ALTERNATING-CURRENT TESTING. By Charles F. Smith. Fifth edition. Manchester, England: The Scientific Publishing Company. 398 pages, 258 illus. and tables. Price, 6 shillings.

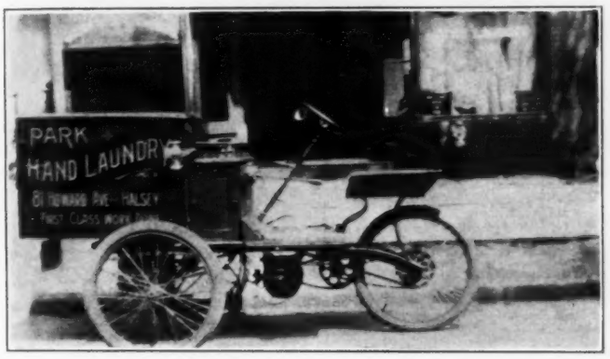
Apart from the fact that the method of presentation renders this book of special interest to students and others engaged in laboratory or testing work, it is eminently a textbook dealing with the principles of alternating-current working. The language is simple and precise; higher mathematics has been avoided, and the opening chapters render the attainment of the more difficult subjects gradual and progressive. The ground covered includes general principles and the proper understanding of reactance, impedance, power-factor and capacity. Then follow transformers, alternators and synchronous motors, rotary converters and induction motors, both polyphase and single-phase. The sine-wave assumption is, of course, made, and vector diagrams are used freely. A short chapter is devoted to the consideration of the root-mean-square, or virtual, value of an alternating quantity, and the relation between this value and the power in the circuit is discussed. The effects produced by waves differing appreciably from the sinusoidal form are, however, not considered in much detail, even in the chapter on capacity. It is not here suggested that the difficult question, "What is an equivalent sine wave?" should be completely answered in a treatise of this kind, but perhaps the reader might have been guided a little farther in this direction. The existence of Chapter XIII (the last), treating solely of the composition of voltage waves, has not been overlooked; but this does little more than explain the action of the oscillograph and some of the processes by which waves can be analyzed into their component parts. There is a beauty and fascination about harmonic analysis which may well outweigh its tediousness; but in these days of economy of time, and quick returns, one is tempted to ask whether the ends attained by harmonic analysis are worth attaining. If the main object is to arrive at the root-mean-square (effective) value of a complex wave, as Mr. Smith would seem to indicate by the conclusion of the chapter under discussion, then it cannot be denied that the end does not justify the means. The author is to be congratulated on the appearance of this fifth edition of one of the best books treating of alternating currents.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Battery-Driven Three-Wheeled Vehicle

The battery-driven three-wheeled vehicle which is shown herewith has been in operation collecting and delivering for a laundry in Brooklyn, N. Y., for a period of six months. When loaded to its capacity (200 lb.) a speed of 8 miles an hour can be maintained. The distance which



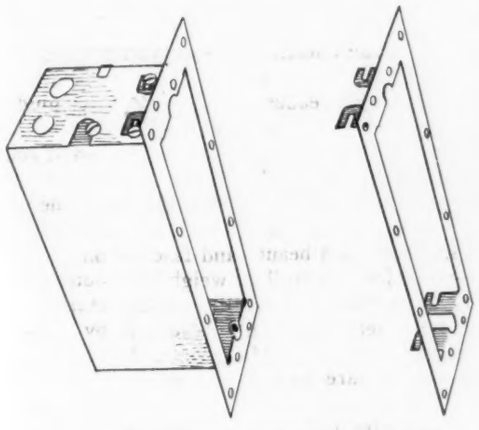
BATTERY-DRIVEN THREE-WHEELED VEHICLE

the vehicle has been able to make on one charge while employed in the laundry business has averaged between 25 miles and 30 miles. All charging was done by means of a mercury-arc rectifier, and it is stated by the maker that with this apparatus the cost of one charge was estimated to be about 16 cents with the energy costing 6 cents per kw-hr. Mr. O. E. Huebner, who designed and built the vehicle, has figured that the total running cost per mile is about 4 cents.

Supporting Plate for Switch-Box Installation

An article of interest to electrical contractors has been brought out by the Flush Plate & Appliance Company, Inc., of Binghamton, N. Y., in the shape of a supporting switch-box plate, a sketch of which is here shown. This plate is stamped from 18-gage galvanized sheet iron (14-gage in the larger sizes for gang boxes) and is designed to serve as a flexible support for the installation of the switch box. Flexibility in only one direction is desired—namely, laterally—and this is gained by means of the slotted lugs near each end of the plate. No up-and-down or in-and-out movement of the box is possible when attached to the plate, and these motions are not ordinarily desired. The plate is tacked or screwed to the lath or furring strips on the wall and forms a substantial support on all sides of the box face, besides offering a ready gage for the plastering around the same, with which it is flush. The brass or nickel-plated switch plate rests on this supporting plate and is fastened to it through the four corner holes.

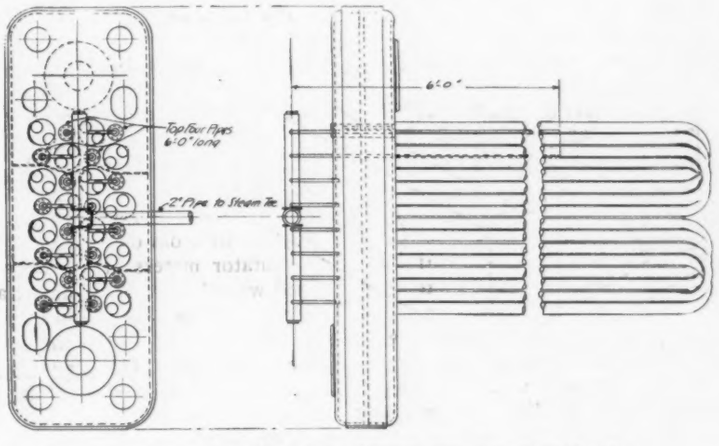
Plates of similar design are made for gang boxes, but only on order, the stock carried being simply of the standard single-box type. These plates have been approved by the Department of Water Supply, Gas & Electricity of New York City, the New York Board of Fire Underwriters and the National Board of Fire Underwriters. They are marketed ten plates to the box and ten boxes to the standard package.



SUPPORTING SWITCH-BOX PLATE

Steam Soot Blower for Superheaters

Soot on superheater tubes interposes additional resistance to heat conduction and its removal increases the efficiency of the superheating system. A mechanical soot blower applied to a superheater manufactured by the Heine Safety Boiler Company, St. Louis, Mo., for the purpose of periodically freeing tubes from soot is shown in the accompanying diagram. Steam nozzles are inserted through hollow stay-bolts used in the construction of the headers and are arranged to discharge steam at high velocity over the tubes. One group of tubes at the top of the superheater may be seen extending nearly to the extreme end of the tubes, while the remaining steam nozzles extend only a short distance within the hollow stay-bolts. The nozzles are all connected by suitable piping and a manifold.

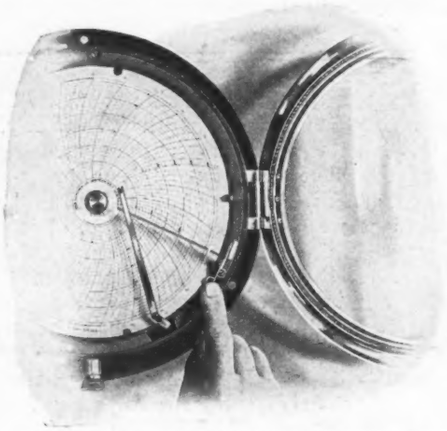


STEAM SOOT BLOWER FOR SUPERHEATERS

It is stated that tests have demonstrated that it is possible to effect a saving of from 5 per cent to 10 per cent of the fuel by blowing the soot from the superheater tubes.

Pen Lifter for Recording Instruments

The Industrial Instrument Company, of Foxboro, Mass., has just perfected a new attachment for its recorders. This attachment is called an automatic release pen lifter and can be attached to any Foxboro improved recorders. The device consists of a german-silver strip mounted on a special holder, which is inserted under the screw head which

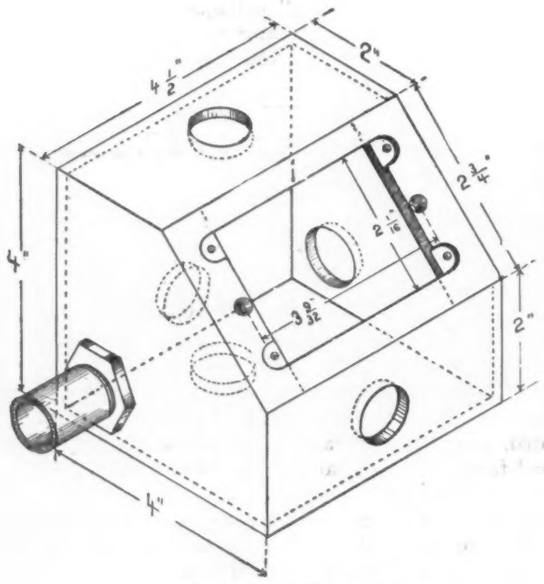


PEN LIFTER FOR RECORDING INSTRUMENTS

holds the chart disk. A slight pressure on a small lever brings the strip up against the pen arm and lifts the pen from the chart. Friction holds it in the raised position, thus giving the operator free use of both hands for removing the used chart and supplying a new one. When the door is closed the pen arm is automatically released and the pen returns to its marking position on the chart. This automatic feature makes it impossible for the operator to forget and leave the instrument out of commission.

Receptacle of Junction Box for Location at 90-Deg. Angles

The metal junction box shown in the accompanying illustration is intended for use at intersections of walls and



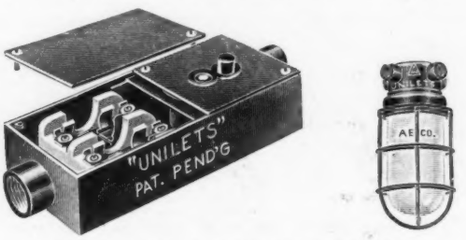
METAL JUNCTION BOX

floors. When used as a junction only a blank flush steel plate is used instead of the flush switch or receptacle plate. The steel plate has four lugs with machine screws which rest in the four depressions shown in the face of the box

The right-hand and left-hand sides of the box are of sufficient area to allow drilling for conduits as large as 2 in. in diameter if desired. Vertical or lateral conduits up to 1 in. in diameter may be applied at the top and front surfaces. The device may be furnished in black enamel or galvanized to match attendant piping. These boxes are made in single sizes only and are drilled to order by their maker, the Fancleve Specialty Company, Boston, Mass.

Conduit Fittings

The two conduit fittings which are illustrated herewith are manufactured by the Appleton Electric Company, of Chicago, Ill. Fig. 1 shows a combination cut-out and dou-

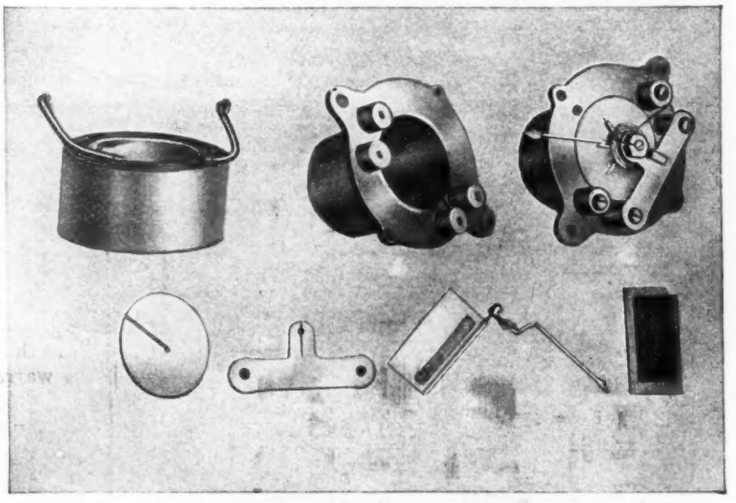


FIGS. 1 AND 2—CONDUIT FITTINGS

ble-throw push-button switch which has been designed for operation on 250-volt circuits. It is claimed that this device is particularly adapted for use on machines which are operated by individual motors. In Fig. 2 is shown a so-called "vapor-proof unilet," which is said to be of value where it is necessary to install lamps out of doors or in places where they will be subject to dampness.

Combination Ammeter and Voltmeter

A combination ammeter and voltmeter which will operate on either alternating current or direct current has been recently put on the market by the Kermel Apparatus Company, Cambridge, Mass. The instrument is provided with a single moving element which is acted upon independently by shunt and series coils. Separate scales are placed upon the face of the instrument for reading amperes and volts, and in some of the instruments two ranges of voltage and



INSTRUMENT PARTS DISASSEMBLED

one for current are provided. This arrangement makes the one meter available for use as six separate instruments. The total weight of the meter is 3.5 lb., and the inclosing walnut case is 6 in. wide by 6 in. long by 3 in. deep.

Electric Water Sterilizer

An electric water sterilizer which has been patented by the Electric Water Sterilizing Company, of Scottdale, Pa., is composed of three principal parts—an electrode box, a coagulation chamber and two filter cylinders. The general arrangement of the apparatus is shown in the accompanying illustration. The electrode box consists of a series of pure-iron plates, separated by marginal insulating gaskets. Through each of these plates, inside of the gaskets, and at alternating ends of the successive plates, is a series of holes. The water is passed successively between the several plates and over the entire plate surface. Electrical connections are so arranged that this entire series of water films is in the circuit at the same time, the voltage between plates being regulated by the number of plates in a series. The current consumed for a plate 10 in. by 10 in. square with city water, treated at a rate of about 400 gal. an hour, is only 0.5 amp at 110 volts.

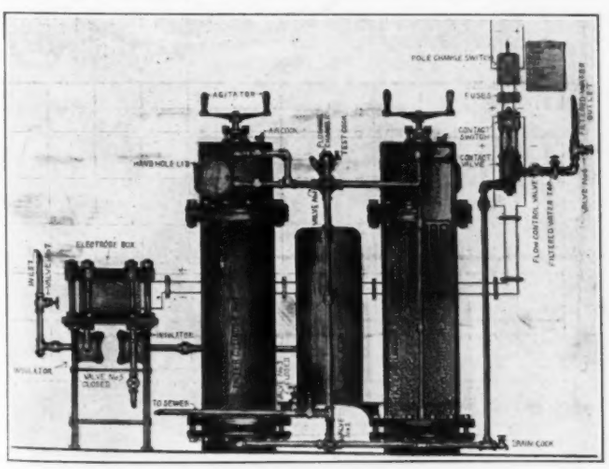
After leaving the electrode box the water passes into the coagulation chamber, where the heavier filth and dirt settles to the bottom, thus preventing the too frequent filling up of the filter beds.

From the coagulation chamber the water passes through the upper part of a four-way valve to the first filter cylinder, down through the filter bed, up through a three-way valve, into the lower section of a four-way valve, and from there flows into the second filter cylinder. The effluent from the second filter bed flows up to a contact valve, which opens, allowing the water to pass, at the same time making an electrical contact directly from the switch on the wall to the electrode box.

The filter cylinder is arranged so that the flocculent coagulant can pass in on top of the filter bed without being broken up by a strainer of any sort used to retain the quartz when flushing. The upper outlet is above a strainer and when the machine is being flushed the inlet check closes and the water flushing the machine passes upward through a gauze strainer, which is supported between the inlet and outlet pipe in the head cylinder. It is impossible to treat water in this type of apparatus with alternating current, so in places where alternating current only is available a converting device is employed.

This direct-current sterilizing machine, it is claimed, will remove color from the water, destroying and removing all vegetable matter and pathogenic germs, and will leave the water bright, pure and sparkling.

By the double-throw, double-pole hand switch on the wall the energy supplied to the machine is reversed in polarity every day. This reversal cleans the plates automatically and the debris can be flushed into the sewer by the valve on the electrode box.

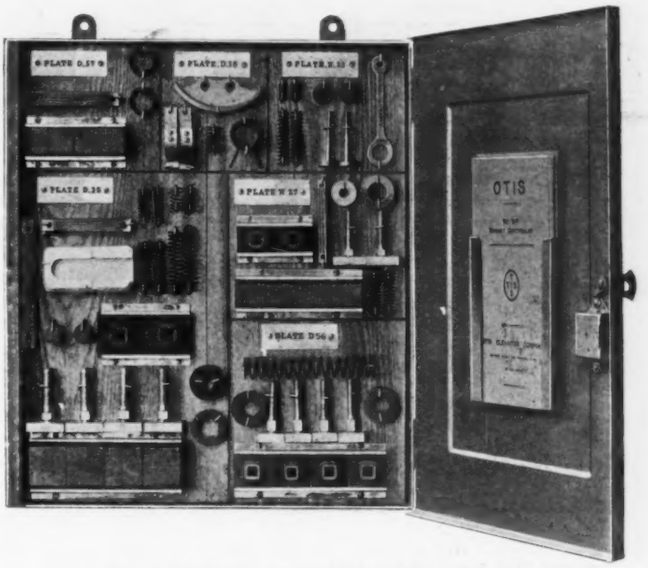


ELECTRIC WATER STERILIZER

Elevator Controller Parts Cabinets

In order to facilitate repair service in the event of breakdowns on elevator controllers a useful device known as a controller parts cabinet has been designed for the convenience of engineers and all who are responsible for elevator maintenance.

This equipment consists of a compact steel box which



CABINET FOR ELEVATOR CONTROLLER PARTS

contains the essential parts of the type of controller furnished with the elevator machine installed. By hanging it in the engine room, the engineer may, on short notice, replace a worn part of the controller and, by referring to the catalog on the inside of the cabinet cover, order immediately a new part to replace the part removed, keeping the cabinet complete for repair work at all times.

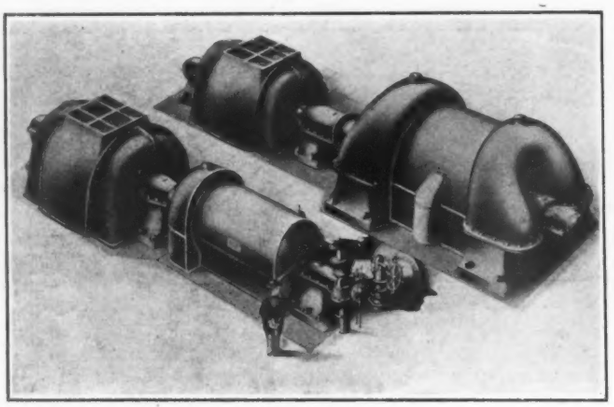
At present these cabinets are being manufactured for direct-current controllers only and are furnished for the more familiar types of controllers used with Otis standard drum and traction machines of all voltages. The cabinets are manufactured by the Otis Elevator Company, Eleventh Avenue and Twenty-sixth Street, New York City.

A 30,000-kw Double-Unit Steam-Turbine Generator Set

The Interborough Rapid Transit Company of New York placed recently with the Westinghouse Machine Company an order for three immense turbo-generator sets, the design of which promises to bring out some new phases of both manufacturing and operating practice. With generating equipment of this capacity—namely, 30,000 kw—these manufacturers claim that after that of reliability of operation the most desirable characteristic is very high efficiency, and that in order to obtain this a large capital expenditure is warranted, since the apparatus is apt to be operated at a high load-factor a large part of the time that it is in operation.

It is conceded that it lies within the range of possibility to build such a set as a single unit operating at either 750 r. p. m. or 1500 r. p. m., but it is claimed that in the case of a machine designed for the lower speed the proportions would be so gigantic as to carry the problem beyond the pale of usual engineering experience, while if the higher speed is contemplated the turbine-blade velocities will rise to a value greater than is at present considered advisable. Moreover, either of these supposed types would involve the use of a combination of impulse and reaction elements

in the turbine, and it is claimed that the highest efficiency is not to be obtained with the former element. To meet these difficulties and the other important consideration that the speed is high and the volume small at the entering point, while at the point where the steam leaves the turbine its speed is relatively low and its volume correspondingly large, it was proposed to build the sets in two units, one generator being driven at 1500 r. p. m. by a high-pressure turbine the exhaust from which would be used in a low-pressure turbine driving the other generator. The accompanying picture gives an idea of the approximate size, shape and arrangement of each of these double-unit sets



30,000-KW DOUBLE UNIT STEAM-TURBINE SET

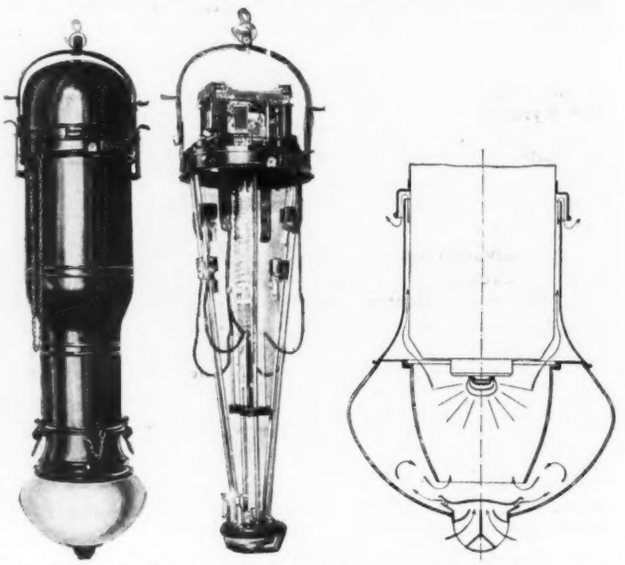
where installed. The blade speeds involved in this design are low, and each turbine element is of exceedingly simple mechanical construction, involving no unusual engineering problems and thoroughly fulfilling the first desideratum of absolute reliability.

The scheme of employing two turbine elements and having the steam pass serially through them is not new. A number of such units of from 1000-kw to 2000-kw rating were built by the Westinghouse Machine Company in 1901. This construction has again come to the front in the case of the English-built Parsons turbine ordered recently by the Commonwealth Edison Company of Chicago. It is new, however, to employ high-pressure and low-pressure elements driving separate generators, each at a different synchronous speed.

The steam supply for these units will carry 120 deg. superheat, and a vacuum of 29 in. will be required for operation. Under these conditions it is claimed by the manufacturer that the steam consumption of each of them will be approximately the same as that for one of the Parsons sets operating on 200 deg. superheat and with 29.2-in. vacuum, conditions much more favorable than can be obtained for the Interborough installation.

Improved Differentially Wound Long-Burning Flaming-Arc Lamp

A long-burning flaming-arc lamp which is said to possess many improved features in design and operation has recently been brought out by the Koerting & Mathieson Company, New York City. This lamp, which is known as the "Excello-duplex" lamp, is provided with a double gravity feed, the mechanism for which is to be seen in Fig. 1 at the top of the lamp. As the operating pair of electrodes are burned and descend a mechanical trip is automatically raised, so that when the extremity of the first pair of electrodes is reached the second pair is brought into the circuit without any interval of darkness or interruption of the lamp. One of the pairs of electrodes is always locked to preclude the possibility of both sets of electrodes burning at once. A double electrode chamber at the arcing points prevents the inactive electrodes from becoming sooted during the operation of the first pair. However, should the inactive electrodes be carelessly left in such a position that they will become sooted they will be automatically cleaned, as they are fed together by a rubbing action induced by eccentrically mounted pulleys controlling the feed. In case



FIGS. 1, 2 AND 3—EXTERNAL AND SECTIONAL VIEWS OF LAMP

the electrodes become jammed the lamp will be automatically cut out of the circuit and a resistor will be inserted to protect the individual lamp and at the same time keep the series in operation.

One of the illustrations herewith (Fig. 3) shows the path of the air which circulates about the arc. Air is admitted through the small baffle plates of the ash tray shown in the bottom of the globe and follows the paths designated by the arrows. In passing through the narrow chamber above the globes the heated air carrying the products of the electrodes' combustion is cooled and caused to deposit the burned material upon the surfaces of the passage. In cleaning the lamp the trimmer lowers the globes and wipes this surface with a cloth.

The photometric curves herewith show the effect of using clear globes and prismatic globes. The prismatic globes flatten out the curve so that the illumination under the lamp is not so great, but in the area between lamps brighter light is afforded.

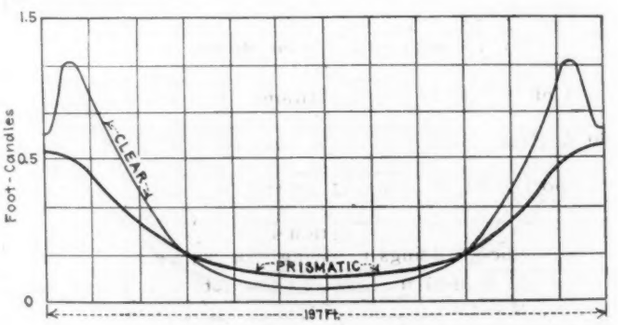


FIG. 4—LIGHT DISTRIBUTION CURVES OF TWO RANGES

The lamp is designed for operation on either alternating-current or direct-current circuits and requires a current of 10 amp. With no auxiliary inductance in the circuit the power-factor of the lamp is said to be 0.83 and the power consumption 382 watts. With an inductor added power-factors as high as 0.68 have been obtained with a consumption of 313 watts.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Pyrene Company Secures Additional Distributing Medium.—The Pyrene Manufacturing Company of New York has recently made arrangements to sell its products to the electrical trade through the Western Electric Company, which will act as a distributer of Pyrene fire extinguishers, liquid and brackets, through its twenty-five branches in this country.

Electro-Galvanizing Plant Opening in Brooklyn, N. Y.—The Metal Treating & Equipment Company, Inc., of New York, is opening a plant at 834 Humboldt Street, Brooklyn, where it will do job galvanizing work by its improved "standard process" of electro-galvanizing. This factory is expected to be ready for work about the middle of the present month.

Electricity Supply for the Kansas City Union Station.—It is reported that the new union station now under construction at Kansas City, Mo., is to have a generating station of its own to supply electricity for lighting and power purposes. Owing to recent strikes the work on the station is now five weeks behind, and it is thought that it will not be completed before next summer.

Headquarters for Diesel Engine Catalogs.—In the Aug. 23 issue of the *Electrical World* a short note appeared describing the latest catalog issued by the Usines Carels Frères, of Ghent, Belgium, on their line of Diesel engines. Mr. W. R. Haynie, of 30 Church Street, New York, American representative of the above concern, informs us that he is prepared to furnish copies of this booklet to interested parties.

Boston Contractor Busy.—The contract for the complete electrical equipment of the proposed Commonwealth Pier at Boston, Mass., has been awarded to Edwin C. Lewis, Inc., of the same city. This concern is at present occupied in the installation of similar equipment in the American College for Girls at Constantinople, Turkey, and it has recently been awarded the contract for electrical work in the United States Custom House and the State Mutual Building, both in Boston.

Prices and Catalogs Desired on Electrical Supplies.—The Electric Supply Company has recently been incorporated, with offices at 21 East Fourth Street, Tulsa, Okla. The secretary, treasurer and general manager of the company is R. C. Steuve, formerly sales engineer in the Cincinnati (Ohio) office of the Allis-Chalmers Manufacturing Company. Mr. Steuve informs us that he would be pleased to receive from the several manufacturers of electrical supplies, catalogs and quotations on the same.

Rate Question in Indianapolis.—The Public Service Commission of Indiana has been petitioned by residents in the northwestern part of Indianapolis to cause the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company to readjust their rates. Some of the people living in that portion of the city say that they pay more than customers in other sections at a greater distance from the generating plants. Discrimination is also alleged between tenants in office buildings receiving like service.

Hickey & Schneider Plan New Factory.—Hickey & Schneider, of 227 Fulton Street, New York, have just completed shipment to the Utah Power & Light Company of a large order of splicing sleeves. The South Carolina Development Company also bought recently a number of large line-disconnecting switches. The manufacturers report that at present their factory is very busy making their various line and power-house specialties and that they are negotiating for land on which they expect to build a new plant.

Few Important Devices Presented for Inspection.—From the Underwriters' Laboratories, 135 William Street, New York, it is learned that their volume of business is normal but that in the way of new apparatus presented for investigation and testing there is little or nothing of wide interest and general applicability coming to their attention at present. A number of special devices of limited interest have been received, the general inspection service offered by the Laboratories is being fully employed, and its label sales are large.

Exports of Duncan Apparatus Large.—The Duncan Electric Manufacturing Company, of Lafayette, Ind., reports that while its meters and transformers have enjoyed an extensive sale in the United States during the past two years, its export trade has amounted to over 25 per cent of its total sales. The company has just completed the construction of a four-story addition to its plant and is now contemplating the building of a five-story fireproof factory structure, which will occupy a quarter of a block of ground area.

New Showroom Opened.—Following the opening of an uptown office at 71 West Twenty-third Street by the Gleason Tiebout Glass Company, a short time ago, it was decided to establish, at the same address and in connection with the office, a showroom for the exhibition of its various lines of lighting glassware. This has been done, and in addition to some of the older styles there are on view at present examples of the Camia, Beaux Arts and Taglio designs that are claimed by the company to be the latest word along these lines.

Kodak Company Increasing Generating Equipment.—The Eastman Kodak Company, of Rochester, N. Y., has recently purchased for its Kodak Park Works a 1000-kw low-pressure steam turbine, connected through a Westinghouse floating-pinion reduction gear to a 250-volt slow-speed, direct-current generator. This equipment was supplied by the Westinghouse Machine Company, which furnished also a 5000-sq. ft. surface condenser, with motor-driven circulating, air and condensate pumps. A cooling tower will be used in connection with the condenser.

Arc Lamps Said to Be Doomed.—In reply to a query as to what is being done in the arc-lamp business to meet the imminent appearance of an incandescent lamp with a specific consumption of ½ watt per candle, a prominent Middle West manufacturer and dealer states that, in his opinion, it is very doubtful whether there will be any improvement in arc lamps which will give them consideration except for exterior illumination. He thinks that for interior illumination they are doomed, but there is a feeling in some quarters that the possibilities of this form of lamp are not nearly realized at the present time, and that, when the subject receives a little more concentrated attention, large improvements are not only possible but probable.

Instruction in Selling Electricity.—The Chicago Central Station Institute, which has been giving instruction to students in the commercial end of the electric-service business, has opened a night class to accommodate applicants unable to attend the day classes. The school is supported by the Insull companies having headquarters in Chicago, and the night classes will be of particular benefit to the present employees of those companies. Sessions will be held on Monday, Wednesday and Friday of each week from 7 to 10 p. m. The full course for the night-class students will cover eighteen months, and the tuition will be $100 for the course, the same as for the day classes. Mr. Fred R. Jenkins is the manager of the institute, which has its office and recitation rooms at 112 West Adams Street.

Predicts Large Future for Electrical Industry.—As reported more fully elsewhere in this issue, a remarkably optimistic statement was made by Frank A. Vanderlip, president of the National City Bank, of New York, at an

informal gathering of leading electrical interests, on Sept. 2-6, at Association Island, Lake Ontario. In his opinion an investment averaging $8,000,000 a week for five years, or over $2,000,000,000, could be profitably used in the electrical industry in this country, during that period, for its development along the lines of transportation, and agricultural and industrial power.

Indiana Utility Contemplating Large Addition to Generating Equipment.—The Merchants' Heat & Light Company, of Indianapolis, Ind., in its electrical department is continuing its efforts to secure the business of large consumers. The company's principal generating station is located at West Washington Street near the White River, Indianapolis. According to E. Darrow, general manager, the company is getting ready to install a new 10,000-kva turbine unit in this station and the order for this equipment will be placed within the next thirty days. He states that new water-tube boilers of 4000-hp capacity will also be required.

Steel Company Decides on Underground Distributing System.—The Pittsburgh Crucible Steel Company, of Midland, Pa., recently extended its plant and installed electric service therein, the distributing system being laid underground in fiber conduit supplied by the H. W. Johns-Manville Company, of New York. It is stated that an overhead system was at first contemplated, but that, while the matter was still undecided, reports were received by the engineers that particularly heavy damage to such lines had been done by a severe storm in the vicinity of Pittsburgh, and that this news caused them to decide upon the underground system of distribution. This installation required about 100,000 ft. of the fiber conduit, which was laid in concrete by one man and a helper at very low cost.

Hollow Glass Column Illumination Planned.—The Lighting Studios Company, 16 East Thirty-third Street, New York, which supplied the distinctive lighting effect at the Carlton Terrace Restaurant, at Broadway and 100th Street in that city, reports that it has been authorized to prepare designs for similar installations at the Winter Garden Music Hall, 1646 Broadway; the Hotel Endicott, Columbus Avenue and Eighty-first Street, and at several of the Marcus Loew theaters, all in New York City. In addition to these special installations, the company is devoting considerable time to the development of a line of standard lighting units, largely of the semi-indirect type, and among the latest and most popular of these is its sanitary dustproof unit for hospital service, in which the company's Doric moonstone hemisphere is used together with a cover of clear glass.

Mica Prices Expected to Drop Slightly.—Meirowsky Brothers, mica importers, of 146 Liberty Street, New York, in a recent interview stated to one of the representatives of the *Electrical World* that there is at present a slightly downward tendency in mica prices, although the volume of business continues good. This concern is at this time supplying a considerable amount of split and punched mica for use in the making of condensers, moving-picture films and various electrical appliances, the manufacturing processes being completed by it, thus saving the customer the necessity of providing special machinery and labor for this work. This business is stated by the firm to be growing in popularity and gradually replacing the older trade in raw mica. In addition to its business in the above lines, the concern handles built-up sheet mica in various thicknesses, and also a certain amount of formed mica for insulating purposes.

Business Increased by Publicity.—The Commercial Electrical Supply Company, of St. Louis, Mo., has, in addition to its jobbing business, a repair and exchange department for electrical apparatus of all kinds. A piece of used apparatus brought to the company may be taken by it in exchange, or bought outright and sent to the company's shop, to be thoroughly overhauled and repaired by a corps of expert repair men. This work includes the rewinding of coils, the rebuilding of commutators, renewal of bearings and various other repairs, and after the machines are overhauled they are sold or exchanged again for others, with a guarantee of satisfactory operation. This is a branch of activity in which the jobbing houses do not generally engage, and it was started by this concern on a small basis. A weekly stock report was issued to its salesmen in addition to the publication of a list of apparatus in its monthly net price sheet. The business grew so rapidly, however, that the company decided to issue a booklet devoted to the description of this end of its service and it reports that in the month following the appearance of this booklet, "The Motor Mart," on Aug. 1, an increase of over 100 per cent in the business of this department was experienced.

Tariff Bill Passes the Senate.—On the afternoon of Sept. 9 the final vote on the tariff revision bill was taken in the Senate and the measure won by a vote of 44 to 37, the margin of seven being two more than the Democratic margin of control in that branch of Congress. The bill was returned to the House of Representatives on the following day, and action will be taken within the next two weeks on the 300 or more amendments made in the Simmons measure to the original bill prepared by Chairman Underwood of the ways and means committee of the House. It is expected that several of the larger reductions made by the Senate will be compromised and that the bill will be signed, in all probability, by about Sept. 25. In the June 28 issue of the *Electrical World* there appeared a discussion of the principal changes made by the Senate in those items of particular interest to the electrical industry, and, as far as can be learned at present, there is little likelihood that any of these items will be further changed. The most important changes made by the Senate in the bill as a whole are those concerning the income-tax feature and the free list and it is probable that these two matters will furnish the principal ground for discussion in the committee of conference, in which each house has an equal voice.

Copper Stocks Reach Low-Record Figures.—At the end of January of the present year the stock of marketable copper of all kinds on hand at all points in the United States had reached the comparatively high figure of 123,198,332 lb. Since that time there has been a rapid decrease in these stocks until, at the end of August, the figures on this item reached the low record of 38,314,037 lb., a drop of over 6,000,000 lb. from the lowest previous mark since statistics have been kept by the Copper Producers' Association. Every month since January (with the exception of July, when there was a small increase) has produced a further decrease in the copper stocks, and the rate of decrease has been so rapid that, if continued for three months more, it would produce an entire depletion of these reserve stocks. Comparison of the figures on production and total deliveries will give some idea of the causes for this reduction of stocks. Since January the delivery has exceeded the production each month excepting July, when the two items were approximately equal. Labor and other troubles at some of the larger mines and refineries have held up production in its several steps during this period, and unusual activity in some of the industries which use the metal extensively has, at the same time, caused a drain on the sources of supply, considerably heavier than normal. The average monthly domestic delivery since January has been in the neighborhood of 71,000,000 lb., somewhat over the normal average, and the average export delivery in the same period has been close to 75,000,000 lb. per month, a large increase over the normal figures. From these statistics it is apparent that the present reserve stocks would serve to meet the volume of deliveries for only about one week's time if production should cease. With this small margin there is anxiety felt in some quarters, where it is feared that the present situation will develop into a runaway market with prices soaring above 20 cents per lb. It is generally felt that for some time to come the copper situation will be strained, since there is small prospect of a material reduction in demand, and it is estimated that no extensive increase in production can be looked for until 1915 when the Inspiration development begins to produce. Reports state that the tension is somewhat relieved at the Lake mines and that some of the men have returned to work, but it is also understood that large numbers of them have left to seek employment in other fields, which, with the inevitable disorganization following the recent troubles, will serve to curtail production there for many months. When it is taken into consideration that the total reserve stocks of the world are also at present very low, so that relief for the domestic situation is hardly to be expected from abroad, it is apparent that all parties interested should act with extreme caution and co-operate to prevent a crisis which would bring good to neither producer nor consumer.

Corporate and Financial

Increase in Galveston-Houston Electric Company Dividend.—A semi-annual dividend of 3 per cent, declared on the common stock and payable on Sept. 15, is an increase in the rate. The last semi-annual dividend was at the rate of 5 per cent per annum, while the one before that was at the rate of 4 per cent per annum. For several years previously the rate of dividend on the common stock was 3 per cent per annum.

Electric Company of America Dissolving.—A special meeting of the stockholders of the Electric Company of America will be held in Philadelphia on Oct. 7 for the purpose of dissolving the corporation. If this action is approved, the outstanding stock will receive 140 per cent in American Gas & Electric 5's and a distribution of the money remaining in the treasury after the expenses of the dissolution proceedings are met.

Issue of Notes by the Appalachian Power Company.—It is proposed to authorize an issue of $3,000,000 of 7 per cent collateral trust notes maturing on Sept. 1, 1918. Of this amount $2,500,000 notes have been sold. The balance are reserved to retire an equal amount of notes due on Nov. 20, 1914. The notes will be secured by the deposit of $3,000,000 of second mortgage 6 per cent bonds and $550,000 of first mortgage bonds.

Plans of the Texas Public Service Company.—The Texas Public Service Company, which was formed in Texas recently for the purpose of acquiring public utilities in that State, has purchased and now owns lighting and ice plants in Bay City, Gilmer, Mount Pleasant and Vernon, Tex. The properties are now being rehabilitated. It is expected that the company will acquire a number of additional utility properties in the State. The present amount of capital stock is $500,000, divided into $125,000 preferred stock and $375,000 common stock. There has also been authorized an issue of $500,000 bonds, of which $375,000 have been sold. The Albert Emanuel Company, of Dayton, Ohio, which controls and operates a number of companies in other states, is interested in the Texas Public Service Company.

Commonwealth Edison May Be an 8 Per Cent Stock.—Chicago newspapers assert that it has been virtually determined by the directors of the Commonwealth Edison Company to pay dividends on the stock at the rate of 8 per cent, instead of 7 per cent, as at present, beginning in November. It is said that this projected increase, to which reference was made in the *Electrical World* of Aug. 2, has been under consideration for nearly a year. Perhaps if the money market had not been so "tight" the directors would have voted the increase several months ago. This rumored increase in the dividend rate, together with the recently announced 10 per cent stock dividend and the decision to issue 10 per cent of new capital at par, is thought to account for the recent rise in the price of the stock on the Chicago Stock Exchange. The stock was quoted on Sept. 3 at 148½.

Electrical Improvements in the New York Subway.—The annual report of the Interborough Rapid Transit Company of New York for the fiscal year ended June 30, 1913, refers to various electrical improvements. In outlining the plans for new subway and elevated construction, it says that additional power requirements for the proposed extensions can be secured at a minimum cost through the installation of new high-pressure turbo-generator units in the company's present main Fifty-ninth and Seventy-fourth Street power houses. Among the additions, betterments and improvements authorized during the year were the equipment of 651 subway cars with storage battery emergency lighting devices; the installation of railings around rotaries in the subway division substations so as to prevent accidents to employees, the installation of an emergency power connection between the Fifty-ninth Street and the Ninety-sixth Street power houses, the substitution of two 300-kw steam-driven turbo-exciter sets for the present 3000-amp storage battery used for exciting current at the Fifty-ninth Street power plant, and the painting of ceilings in seventy-nine cars white in order to improve the appearance and provide better lighting reflection. Among the improvements made in the subway division that were charged to current earnings were the equipment of 276 cars with tungsten lamps, the installation of two battery-charging plants for maintaining emergency lights and the painting of ceilings of seventy-nine cars white.

Financial Plans of the Mississippi River Power Company.—Following the completion of the construction period and the inauguration of its operating period, the question is being asked as to what plans are being made for the payment of dividends on the outstanding $6,000,000 of preferred stock of the Mississippi River Power Company. This issue was made at 80 in the form of receipts, exchangeable on July 1, 1913, for permanent certificates. Up to this time dividends have been paid on this stock at 6 per cent on the paid-in value and charged against construction cost, but from now on they will have to be paid out of income. After Jan. 1, 1915, this stock becomes cumulative. The interest charges which have to come out before dividends are on $19,000,000 of 5 per cent first mortgage bonds and $2,500,000 of 6 per cent notes, maturing Jan. 24, 1914. This interest amounts to about $1,125,000, or nearly $325,000 less than the estimated net earnings of the company for the year ended June 30, 1914. This excess represents about 5 per cent on the outstanding preferred stock, and while it is not likely that the full 6 per cent dividend will be paid until after Jan. 1, 1915, the company will probably continue the present dividend until then, as it may do out of its earnings. The company is now selling more than 80,000 hp, and has, with present development, 120,000 hp available, which is ultimately to be increased to 200,000 hp. For the development of the additional 80,000 hp about $6,000,000 has already been expended, so that when it becomes necessary to add to the present development the installation of the additional equipment will not be an expensive operation for the company.

Statement of the Copper Producers' Association for August

The stocks of copper on hand on August 31 were the lowest ever reached in the history of the association. The figures on production and consumption during last month are as follows:

	August, pounds		July, pounds	
Stocks on hand in the United States on first of month		53,594,945		52,904,606
Production		131,632,362		138,074,602
		185,227,307		190,979,208
Domestic deliveries	73,649,801		58,904,192	
Foreign deliveries	73,263,469		78,480,071	
		146,913,270		137,348,263
Stocks on hand at end of month		38,314,037		53,594,945

NEW YORK METAL MARKET PRICES

	Sept. 2 Bid.	Sept. 2 Asked.	Sept. 9 Bid.	Sept. 9 Asked.
Copper:				
Standard, spot*	....	....	15.50	to 16.37½
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard, spot*	71 12 6		73 5 0	
Prime Lake	....	16.25	16.75	to 16.87½
Electrolytic	16.12½	to 16.25	16.60	to 16.70
Casting	15.87½	to 16.00	16.40	to 16.50
Copper wire base	17.00	to 17.25	17.75	to 18.00
Lead		4.75		4.75
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f. o. b. smelter		8.00		8.00
Spelter, spot	....	5.90	.....	5.90
Tin, spot*	42.90	to 43.25	42.40	to 42.75
Aluminum:				
Prompt delivery	21.50	to 22.50	21.50	to 22.50
Future	20.00	to 21.00	20.00	to 21.00

*OLD METALS

Heavy copper and wire	14.50	14.75
Brass, heavy	9.25	9.25
Brass, light	8.25	8.25
Lead, heavy	4.65	4.65
Zinc, scrap	4.62½	4.75

*COPPER EXPORTS

Total tons to Sept. 9 9243

*From daily transactions on the New York Metal Exchange.

Business Notes

The C & C Electric & Manufacturing Company, of Garwood, N. J., has recently appointed T. E. Jewell manager of its New England office at 120 Milk Street, Boston, Mass.

The Triumph Electric Company, of Cincinnati, Ohio, announces that W. W. Van Ausdall has been appointed sales engineer in charge of its special reversing planer motor department.

Staege-Bennett & Dewey.—Staege & Bennett, engineers, and Charles E. Dewey, architect, on Aug. 1 became copartners under the firm name Staege-Bennett & Dewey, Watertown, N. Y.

D. C. & Wm. B. Jackson.—Mr. Edward L. Moreland has been appointed manager of the Boston office of D. C. & Wm. B. Jackson, which was moved recently from 84 State Street to the Garden Building, 248 Boylston Street.

The Fred W. Nason Company, of 39 Cortlandt Street, New York, has just been appointed sales agent for the territory including New York, New Jersey, Pennsylvania, Delaware and Maryland, to handle the product of the Barnes & Kobert Manufacturing Company, of New Haven, Conn., maker of a full line of strain insulators, guy clamps, cable racks and brackets, and pressed-steel insulator pins.

New Industrial Companies

The National Electric Sign & Construction Company, of Mansfield, Ohio, has been chartered with a capital stock of $50,000. The incorporators are E. P. Robbins and others.

The Storage Battery Company of America, of Chicago, Ill., has been incorporated with a capital stock of $30,000 by Harry A. Bioscat, William H. Smith and Noah Divilbisa, 806 Asen Building, Chicago, Ill. The company proposes to manufacture electrical supplies.

The Imperial Gas & Electric Fixture Company, of Camden, N. J., has been incorporated with a capital stock of $25,000 for the purpose of manufacturing gas and electric fixtures. The incorporators are: S. W. Collin, H. Schwartz, of Riverton, and W. Wilkinson, of Collingswood.

The Chanoler Company, of Newark, N. J., has been incorporated with a capital stock of $25,000 to manufacture mechanical inventions and as model makers, machinists, etc. The incorporators are G. C. Hirst, E. L. Hirst, of Montclair, N. J., and E. P. Hirst, of Philadelphia, Pa.

The Peterson Electric Company, of Wheeling, W. Va., has been incorporated by Hugo Peterson, Joseph A. Armstrong, of Wheeling, W. Va.; Harry Brandfass, of Warwood, W. Va., and L. Wayt, of Bridgeport, Ohio. The company is capitalized at $10,000 and proposes to deal in electrical heating apparatus, power appliances, electrical supplies, hardware, etc.

Trade Publications

Electric Vibrators.—A recent pamphlet of the Shelton Electric Company, 4 East Forty-second Street, New York, is devoted to Shelton vibrators, therapeutic appliances and massage apparatus for physicians.

Laundry Machinery.—The Conlon electric washer is fully described and illustrated in a booklet published by the Conlon Electric Washer Company, 312 North May Street, Chicago. Its ease of operation, its economy, simplicity and efficiency are pointed out.

Wires.—A thirty-two-page pamphlet has recently been issued by the American Insulated Wire & Cable Company, Chicago, which contains data and price lists on its bare and insulated wires. A tabulated statement is printed showing the monthly average of copper from 1883 to 1913.

Iinstruments.—Bulletin No. 175 of the Bristol Company, Waterbury, Conn., refers to electric resistance thermometers, model 162. Electric pyrometers are discussed in Bulletin No. 176. In Bulletin No. 178 wet and dry bulb recording thermometers are illustrated and described.

Telephones.—The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has recently issued a folder in which are illustrated and described various types of "Central Energy" telphone equipment. Wall telephones, desk telephones and combination telephones are shown.

Testing Set.—A full-sized representation of the Type S portable Wheatstone-bridge-testing set manufactured by the Leeds & Northrup Company, Philadelphia, is being sent out by the company in the form of a large double cardboard folder. The galvanometer is of the company's new interchangeable type.

Lighting Units for Hospitals.—A sanitary dustproof lighting unit, designed by the Lighting Studios Company, 16 East Thirty-third Street, New York, is made the subject of a four-page leaflet. These units are especially designed for use in hospitals and are adapted also to other installations where a similar kind of lighting is required. The unit is said to be free from glare and to be dustproof.

Lamps for Photographic Purposes.—Bulletin No. 49, issued by the Cooper Hewitt Electric Company, Eighth and Grand Streets, Hoboken, N. J., gives information regarding the Cooper Hewitt lamp for photographic purposes. This lamp is used for many photographic processes, as a substitute for daylight. Brief descriptions of the various outfits are accompanied by miniature illustrations of the apparatus.

Motors.—The Peerless Electric Company, Warren, Ohio in Bulletin No. 35 sets forth the general characteristics of its single-phase alternating-current motors in fractional horse-powers. These motors are of the induction type, with rotating secondary member. The motors are of the squirrel-cage type, steel-laminated, with copper conductors securely riveted to copper end-rings, soldered to insure perfect contact and ground to size.

Electric Welding Apparatus.—The C & C Electric & Manufacturing Company in its Bulletin 513 C gives a complete description of its new multiple-unit arc-welding outfit. With this apparatus several operators can work from the same machine and use either graphite or metallic electrodes and perform all kinds of welding operations by means of the electric arc. Tables, curves and test data are given, together with numerous interesting photographs showing the wide variety of welding repairs made with this outfit.

Wiring Specialties.—Catalog No. 16, which has just been published by the Arrow Electric Company, Hartford, Conn., contains ninety-six pages, in which are illustrated and described the company's numerous wiring specialties. Many new devices made since the last catalog was issued necessitated doubling the number of pages of the older one. The material has been so arranged as to afford ready reference to any particular device. The pamphlet is of standard size, punched for convenience in inserting in a binder, is well printed and has an attractive cover.

Motors, Controllers, etc.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has added to its periodical bulletins a number on the following subjects: crane controllers for slip-ring motors, float switches for alternating-current motors, magnetic disk brakes, heavy-duty starters with no-voltage release, index and general description of self-starting speed regulators, double-pole float switches, floor stop devices and manually operated starting compensators for alternating-current motors. Some of these bulletins take the place of others formerly printed on the subject.

Condensers for Wireless Work.—The Dublier Electrical Syndicate, Ltd., of 96, 98 Leadenhall Street, London, E. C., in a new illustrated circular describes its improved form of condensers for work in wireless telegraphy. Owing to the unique construction of these condensers it is declared that they occupy only one-tenth the space and weigh but one-tenth as much as other high-tension condensers of similar capacity. They are also said to be more efficient and to be free from brush discharge or leakage. A number of these condensers have already been furnished for pressures up to 30,000 volts. A 0.006-microfarad condenser for 30,000 volts working pressure will withstand a breakdown test of 75,000 volts, and in physical dimensions it measures only 18 cm by 15.5 cm by 8.5 cm.

Personal Mention

Mr. Henry F. Black has been appointed superintendent of the Dallas City (Ill.) Electric Company.

Mr. J. G. Cronin has been appointed superintendent of the municipal light and water plant at Perry, Okla.

Mr. Henry D. Jackson, consulting engineer, Boston, will sail on Sept. 20 for Bermuda for a three months' trip for rest and recreation.

Mr. J. W. Lillienthal, of San Francisco, has been elected successor to Mr. Patrick Calhoun as president of the United Railroads of San Francisco.

Mr. R. H. Henderson, formerly manager of works of the Westinghouse Lamp Company, Bloomfield, N. J., has resigned his position to engage in other work.

Mr. Albert M. Chambers, of the Electric Properties Company, New York, has been elected president of the Northern Colorado Power Company, succeeding Mr. W. J. Barker, Denver, resigned.

Mr. Thomas A. Edison has returned to his laboratory at East Orange, N. J., following a motor trip through New England. Mr. Edison is reported to have benefited from his vacation in both health and weight.

Prof. R. W. Sorensen, of the department of electrical engineering, Throop Polytechnic Institute, Pasadena, Cal., has been appointed supervising engineer for the Pacific Light & Power Company at its Big Creek generating station.

Mr. H. U. Wallace has been re-elected vice-president and general manager of the Northern Colorado Power Company and will assume complete charge of the operations of the company, whose headquarters were recently moved to Boulder, Col.

Mr. Webster W. Benjamin has resigned his position as electrical engineer with the Sunnyside Mines Company at Eureka, Col., to become electrical engineer and master mechanic for the Ozark Smelting & Mining Company, Magdalena, N. M.

Mr. O. W. Rector, who for two years has been general superintendent of the gas department of the George Carson property at Washington, Ia., has severed his connection to take the position of general superintendent of the People's Gas & Electric Company of Mason City, Ia., which is now owned by the United Light & Railway Company.

Mr. R. G. Black, formerly superintendent of the Toronto Electric Light Company, has been appointed a member of the Toronto Hydroelectric Commission to fill a long-standing vacancy caused by the resignation of Mr. H. L. Drayton, an account of whose appointment to the chairmanship of the Dominion Railway Board appeared on page 865 of our issue dated April 26, 1913.

Mr. Justus Eck, of London, England president of the Koerting & Mathieson Company, will sail for America on the *Majestic*, Oct. 1. Throughout England and Australia Mr. Eck is known as an authority on illumination, and on his many trips he has delivered lectures on this subject the information contained in which was gathered from all quarters of the globe.

Mr. J. F. Martin, who for the past year has been manager of the new-business department of the United Light & Railway Company, at Iowa City, Ia., has been transferred to the People's Gas & Electric Company at Mason City to assume similar duties. Mr. Martin was formerly connected with the Milwaukee Electric Railway & Light Company at Kenosha, Wis.

Mr. Frank S. Washburn, of Nashville, Tenn., president of the American Cyanamid Company, has been elected president of the Alabama Power Company. Mr. Washburn is also president of the Goodman Manufacturing Company, of Chicago, and consulting engineer of the Crescent Coal & Coke Company, of Nashville, besides his connections with other industrial and banking institutions.

Mr. Edward W. Doty, of Cleveland, Ohio, has been appointed a member of the Ohio State Public Utilities Commission, the other two members of which are Messrs. Oliver P. Hughes, chairman, and Judge W. L. Dechant. Mr. Doty was a member of the 1911 constitutional convention and also served on the commission which framed Cleveland's recent progressive city charter.

Mr. William B. McKinley, president of the Illinois Traction System, Peoria, Ill., which operates a number of electric-lighting properties in the Middle West, had a farewell dinner tendered him at the Country Club at Peoria recently by Mr. Frederick H. Smith and Mr. H. E. Chubback, vice-president executive of the Illinois Traction System. Mr. McKinley will shortly sail from Seattle for Japan on a tour of the world originally planned two years ago.

Mr. George Smith, until recently a construction engineer connected with the Fort Wayne Electric Works, has been appointed general superintendent of the municipal electric service of the city of Fort Wayne, Ind. Mr. Smith had charge of the installation of the Fort Wayne municipal plant at the time the present plant was placed in operation. He also had charge of the work of rehabilitating the Fort Wayne municipal plant at the time of the disastrous flood of last March.

Mr. John W. Hancock, general manager of the Roanoke (Va.) Railway & Electric Company, has been chosen general manager of the Lynchburg (Va.) Traction & Light Company and its subsidiaries. Mr. Hancock will continue to supervise the Roanoke property, dividing his time between Lynchburg and Roanoke. Mr. Hancock was born in Franklin County, Va., and has lived in Roanoke since 1890. He entered the service of the Roanoke Street Railway Company in April, 1895, and was appointed general manager when it was reorganized and expanded early in 1900. He is also president of the Public Service Association of Virginia, the Mill Mountain Incline, Inc., Roanoke, and the Little Tunnel Water Power Company, and is a vice-president of the Roanoke Chamber of Commerce.

Mr. H. L. Bleecker, who was elected president of the Northwest Electric Light & Power Association at its Seattle (Wash.) convention, Sept. 5, is the second vice-president of the Washington Water Power Company, of Spokane, Wash. He was born at Belleville, Ontario, in 1873, his parents being citizens of the United States. In his early childhood the family moved to Los Angeles, Cal., where the son's education was obtained in the public schools. At the age of nineteen Mr. Bleecker entered the employ of the old Los Angeles Cable Railway Company, being first connected with the legal department. About two years later he was admitted to practice in the courts of California. In 1900 he took up his residence in Spokane, Wash., and became affiliated with the Washington Water Power Company, acting in the capacity of the general manager's clerk. He was later promoted to be assistant secretary, then secretary, and finally to the position of second vice-president, which he now holds.

H. L. BLEECKER

Obituary

Clifford L. Pullen, who died of acute indigestion in the St. James Hotel, Philadelphia, Sept. 5, was prominent in the promotion plans of the Youghiogheny Water & Electric Power Company, New York, which is developing hydro-electric plants on the Youghiogheny River near Friendville, Md. Mr. Pullen was fifty years of age and resided at West Hampton, L. I.

Charles A. Sterling, who was a vice-president of the Public Service Corporation of New Jersey, Newark, N. J., from 1903 until the time of his retirement from active business five years ago, is dead. He became connected with the Public Service Corporation following the absorption of the Orange & Passaic Valley Electric Railway, of which he had been president. Mr. Sterling was seventy years old.

Construction

New England

MONTPELIER, VT.—The capital stock of the Montpelier & Barre Lt. & Pwr. Co. has been increased from $2,100,000 to $2,310,000.

MONTPELIER, VT.—The Consol. Ltg. Co., of Montpelier, has leased the property of Moody & Almon, of Montpelier, consisting of two power plants on Mad River in Moretown, and a steam power plant in this city, transmission lines to and distribution systems in the towns of Moretown, Waitsfield, Northfield and Montpelier.

BOSTON, MASS.—The contract for electrical equipment, including lighting, power and transmission for the new Commonwealth Pier, has been awarded to Edwin C. Lewis, Inc., 121 Federal Street, Boston, electrical engineer and contractor.

PLYMOUTH, MASS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 9 for construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, interior lighting fixtures and approaches, of the United States post office at Plymouth, Mass. Drawings and specifications may be obtained at the above office or from the custodian of site at Plymouth. O. Wenderoth is supervising architect.

SPRINGFIELD, MASS.—The advisability of establishing an electric power plant in the proposed new High School of Commerce is being considered by Alderman George H. McClean, of the city property committee, H. L. Dorman, schoolhouse agent, and Edwin J. Parlett, of Kirkham & Parlett, architects for the school. The cost of the proposed building is estimated at $600,000.

NEWPORT, R. I.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 4 for furnishing and installing boilers, heaters, centrifugal pumps, turbines, coal conveyor and piping connections, underground piping systems for distribution of steam, hot and cold water, a sewer, electrical conduits and brick chimney for the naval hospital, Newport, R. I. The cost of the work is estimated at $40,000. Plans and specifications may be obtained on application to the bureau. H. R. Stanford is chief of bureau.

Middle Atlantic

BINGHAMTON, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Sept. 22, for the reconstruction of electric-lighting system, steam and exhaust piping at Binghamton State Hospital, Binghamton. Separate proposals will be required for the following branches of the work: Engines, generators, steam piping, switchboards and electric work. Drawings and specifications may be seen and blank form of proposals obtained at the Binghamton State Hospital, Binghamton, and at the office of Lewis F. Pilcher, state architect, Capitol, Albany. Plans and specifications may be secured at the office of the state architect. J. H. B. Hanify is secretary of the State Hospital Commission.

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 23 for furnishing at the navy yard, Brooklyn, the following supplies: 5733—fiber conduit, etc., vitrified clay duct, electric cable, transformers, watt-hour meters, end bells; Schedule 5734—cast-iron and galvanized pipe and fittings, gate valves, fire hydrants; Schedule 5316—rotor shafts, etc.; Schedule 5823—submarine thermometers, water gages, cartridge fuses. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, New York, or to the bureau. J. T. Cowie is paymaster general, U. S. N.

CHATHAM, N. Y.—The Board of Trustees is investigating the matter of installing an electric plant to furnish electricity for pumping water and for street lighting in Chatham. Gas-producer or oil-burning engines are being considered for motive power. As yet no decisive steps have been taken or engineer engaged. George E. Burrows is village clerk.

COHOES, N. Y.—The Public Service Commission has granted the Cohoes Co. permission to exercise its rights and privileges under a franchise granted by the State to construct a hydroelectric plant upon lands in the bed of the Mohawk River at Cohoes. The company proposes to generate electricity for use of the factories and mills in Cohoes now using water-power. The New York office of the company is at 2 Rector Street.

CORNING, N. Y.—The Corning Lt. & Pwr. Corpn. expects to purchase a 40-hp return tubular boiler for gas plant. J. H. Doherty is general manager.

CROTON FALLS, N. Y.—George Juengst & Sons, owners of the local electric-light plant, expect to purchase within the next four months one 175-kw, three-phase, 60-cycle, 2300-volt vertical generator and switchboard complete with instruments.

ELMIRA, N. Y.—The Elmira Wtr., Lt. & R. R. Co. expects to purchase within the next two months switching equipment, including switches and protective devices and material for distribution system, including poles, towers, lightning arresters, insulators, distribution cable and combination trolley and boulevard lamp-posts; also electrical appliances, including heating and cooking apparatus. F. H. Hill is general manager.

LOCKPORT, N. Y.—The Lockport Lt., Ht. & Pwr. Co. has just closed a contract with the city of Lockport for street-lighting for a period of three years, beginning Sept. 9. The contract calls for 515 6.6-amp magnetite arc lamps at $54 each per year with all-night and every-night service. C. M. Kaltwasser is manager.

LYONS, N. Y.—The Village Board is considering a proposition to adopt a new street-lighting system. It is proposed to install ornamental standards carrying cluster lamps in the business district and to erect single lamps in the parks and residence sections, to cost $5,015 per year. Under the present contract it costs the village $7,000 per year to light the streets. If the proposed plan is adopted, the location of the lamps will be changed.

NASSAU, N. Y.—At an election held recently the proposition to install an electric-street-lighting system to replace the present kerosene lamps now in use was carried.

NEW YORK, N. Y.—Bids will be received by the Public Service Commission, First District, 154 Nassau Street, New York, until Oct. 2, for construction of section No. 2 of routes Nos. 4 and 38, Seventh Avenue-Lexington Avenue rapid transit railroad of New York City, a four-track subsurface railroad under Greenwich Street, West Broadway and Varick Street, borough of Manhattan, between a point in Greenwich Street about 70 ft. south of Vesey Street and a point about 100 ft. south of Beach Street. Form of contract, plans and specifications may be obtained from the Public Service Commission.

NEW YORK, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Sept. 22, for construction, heating, plumbing and electrical work for the nurses' home at Manhattan State Hospital, Ward's Island, N. Y. Separate bids will be required for each division of the work and no combination of bids will be considered. Drawings and specifications may be consulted and blank forms of proposals obtained at the Manhattan State Hospital, Ward's Island, and at the office of the State Hospital Commission, 1 Madison Avenue, New York City. Complete sets of plans and specifications may be obtained upon application to Lewis F. Pilcher, state architect, Capitol, Albany.

OSSINING, N. Y.—Bids will be received by John B. Riley, superintendent of State Prisons, Capitol, Albany, until Sept. 30 for boilers, steam apparatus and piping for new power plant and electric feeder system for Sing Sing Prison, Ossining. Drawings and specifications may be consulted and blank forms of proposals obtained at Sing Sing Prison, Ossining, and at the office of Lewis F. Pilcher, state architect, Capitol, Albany.

SCHENECTADY, N. Y.—The Board of Contract and Supply, it is reported, have rejected all bids for electric wiring of three new schools; new bids will be asked for. The cost of wiring the three buildings is estimated at $15,000.

KITTANNING, PA.—The Borough Council has engaged F. G. Ross, civil engineer, of Pittsburgh, to prepare plans and estimates for the installation of a municipal electric-light plant and water-works system.

PATTON, PA.—The Penn Central Lt. & Pwr. Co., of Altoona, which recently took over the management of the George S. Good El. Lt. Co., of Patton, will make improvements to the system and service. Energy for operating the system will be supplied by the 45,000-volt transmission line from the power stations at Warrior Ridge and Williamsburg. E. B. Greene, of Altoona, is general manager of the Penn company.

PECKVILLE, PA.—The managers of the municipal electric-light plant of Blakely Borough expect to install within the next 30 days one 450-hp Harrisburg four-valve engine directly connected to a 300-kw General Electric two-phase, 60-cycle, 2300-volt, alternating-current generator; also to purchase one 15-kw, 125-volt exciter, four-panel switchboard, three voltmeters, four ammeters, voltage separators, paralleling instrument, etc. Material has been purchased for the erection of 1½ miles of distribution lines, including a 60-kva transformer, and it is expected to duplicate the same within the next three months. Thomas F. Grogan is superintendent.

PHILADELPHIA, PA.—The merger of six electric companies chartered to operate in the vicinity of Philadelphia along the lines of the Philadelphia & Western Railway, under the name of the Interborough El. Lt. & Pwr. Co., has been approved by the State Department. The company is capitalized at $30,000 and the main offices will be in Philadelphia. The companies taken over are the Milbourne, Cooperstown, Ithan, Guelph, Gladwine and Interborough. Thomas Newhall, of the railway company, is president.

PITTSBURGH, PA.—Arrangements have been made by the Armstrong Cork Co., of Pittsburgh, for an extension of its power plant on Twenty-fourth Street, to cost about $38,000.

POTTSVILLE, PA.—The Eastern Pennsylvania Lt., Ht. & Pwr. Co. announces its intention of adding 10 more companies to its list, all of which are expected to be chartered in September. Some of the companies will be located in Girardville, Gilberton, Ryan, West Mahanoy and Butler Townships in Columbia County. The incorporators are: W. B. Rockwell, general manager of the Eastern Pennsylvania Ry. Co.; Ira G. Walborn, superintendent, and Van Dusen Rickert, treasurer of the Pottsville Edison El. Illg. Co.

GLEN GARDNER, N. J.—Bids will be received at the office of the New Jersey Sanatorium for Tuberculous Diseases, Glen Gardner, N. J., until Oct. 2 as follows: (1) For construction and equipment of a power plant; (2) for construction of Tuberculous Pavilion for the New Jersey Sana-

torium for Tuberculous Diseases, in accordance with plans and specifications on file in the office of the commissioner of charities and correction, State House, Trenton. Separate bids to be submitted for each division. For further information address Joseph P. Byers, commissioner of charities and correction, State House, Tenton, or Dr. Samuel B. English, superintendent, Glen Gardner.

BALTIMORE, MD.—Extensive improvements, it is reported, will be made to the power plant of the Consol. Gas, El. Lt. & Pwr. Co. at Westport, involving an expenditure of $500,000. The work will include construction of boiler house with complete equipment for coal-handling apparatus, stokers, pumps and heaters; the stacks are to be 250 ft. high and 20 ft. in diameter (inside). The first installation is to consist of six 1000-hp boilers equipped with automatic stokers.

ROCKVILLE, W. VA.—Preliminary plans have been prepared by the Hydro-Electric Co., of West Virginia, for the construction of a large hydro-electric plant and dam near Big Sandy Creek, near Rockville. The dam will be of concrete, 200 ft. high and 1600 ft. long; the power house 60 ft. by 100 ft. and will have a generating capacity of 65,000 kw. The cost of the plant is estimated at $5,000,000. Work will begin next spring provided the plans are approved by the state officials.

WILLIAMSON, W. VA.—The Williamson Lt. & Ice Co. expects to install an additional 35-ton motor-driven ice machine. O. B. Welch is vice-president and general manager.

COVINGTON, VA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 8 for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, interior lighting fixtures and approaches, of the United States post office at Covington, Va. Drawings and specifications may be obtained from the custodian of site at Covington, Va., or from the above office. O. Wenderoth is supervising architect.

North Central

CLEVELAND, OHIO.—Bids will be received at the office of the secretary of the director of public service, 204 City Hall, Cleveland, until Sept. 18 for furnishing luminous-arc lamps and equipment for the Municipal Electric Light Department of Cleveland, in accordance with plans and specifications, which may be obtained at the office of the engineer of construction, 419 City Hall. W. J. Springborn is director of public service and W. H. Kirby secretary.

ORRVILLE, OHIO.—At a special election held Aug. 26 the proposition to issue $40,000 in bonds for the installation of a municipal electric-light plant was carried. Frank B. Rae, Engineers' Building, Cleveland, Ohio, is engineer.

RAVENNA, OHIO.—The city of Ravenna is planning to install new pumping machinery, at a cost of about $32,000. The equipment will include a turbo-generator, with a rating of from 200 kw to 300 kw, two motor-driven centrifugal pumps, having a capacity of 3,000,000 gal., one condensing and feed-water pump and 7000 ft. of transmission line. Bids therefor will be received about Nov. 1. W. H. Linton is director of public service.

CATLETTSBURG, KY.—The Carpenter El. Lt. & Pwr. Co., of Catlettsburg, has sold its property to the Ohio Valley El. Co., of Benwood, W. Va. This gives the Ohio company possession of all the electric power plants between Guyandotte, W. Va., and Hanging Rock, Ohio.

HARRODSBURG, KY.—Bids will be received by the town of Harrodsburg until Nov. 1 for following equipment for the municipal electric-light plant: One 200-hp tubular boiler complete with setting and equipped with Detroit stokers, one duplex feed pump for 400-hp boilers, one 200-kw, 220-volt direct-current generator and engine, directly connected; also 5000 lb. 0000 weather-proof wire and 2000 lb. 0 wire.

LAKELAND, KY.—The electric light and power plant at the Central Asylum for the Insane at Lakeland was recently destroyed by fire, causing a loss of about $12,000.

LOUISVILLE, KY.—The ornamental lighting system recently authorized by the Board of Park Commissioners for installation of ornamental lamps in the parks and along the boulevards is to be extended on the Eastern Parkway several miles west from Cherokee Park and designed ultimately to connect Cherokee and Shawnee Parks. The cost of the system is estimated at $3,000 per year. The Louisville Gas & El. Co. will erect the standards and maintain the service.

INDIANAPOLIS, IND.—Arrangements are being made by the American Creosoting Co. for the construction of a power plant at its new factory at Sherman Drive and the Belt Railway. The equipment of the proposed plant will include four boilers with a rating of 150 hp each, equipped with automatic stokers. A smokestack 148 ft. high and 5 ft. in diameter (brick and metal construction) will be erected.

JEFFERSONVILLE, IND.—The contract for street lighting is reported to have been awarded to Owen L. Carr, of Rushville. Mr. Carr, it is understood, will erect a plant here.

GALESBURG, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 17 for conduit and wiring, lighting fixtures, plumbing, etc., in the United States post office at Galesburg, in accordance with specifications and drawings, copies of which may be secured at the above office or at the office of the custodian at Galesburg. O. Wenderoth is supervising architect.

GRAND RIDGE, ILL.—The local plant of the Northern Illinois Pub. Ser. Co. was destroyed by fire on Sept. 2, causing a loss of about $5,000. At present the town is without electrical service.

STERLING, ILL.—The Rock River Lt. & Pwr. Co. is reported to have purchased the power rights of the Sterling Hydraulic Co. in the government dam here. It is understood that the Rock River company will begin work at once developing the power. The cost of the improvements is estimated at about $200,000.

TAMAROA, ILL.—Bonds to the amount of $6,500 have been voted for the installation of a municipal electric-light system in Tamaroa. The contract for the construction of the plant has been awarded to Thomas Russell, of Du Quoin.

GRAND RAPIDS, WIS.—The Grand Rapids El. Co. expects to purchase within the next 12 months a new street-lighting system. The city has voted to purchase the plant of the Grand Rapids El. Co. and has started the necessary proceedings. M. N. Weeks is manager.

LAKE MILLS, WIS.—Within the next 10 or 15 days the municipal electric-light and water plant will be connected with the Kilbourne dam power plant. B. C. Engsberg is superintendent.

PORTAGE, WIS.—At an election held recently bonds were voted for the installation of a municipal electric-light plant.

FAIRMONT, MINN.—The Board of Electric Light and Water Commissioners expects to erect within the next two months a new structural steel building, 84 ft. by 80 ft. over the present building, for the municipal water and light plant for which material has been purchased. Contracts have been received for new generating equipment.

GRACEVILLE, MINN.—At an election held recently the proposition to sell the municipal electric-light plant to the Otter Tail Pwr. Co., of Fergus Falls, and to grant the latter a franchise to operate a plant in the village, was carried.

LAKE PARK, MINN.—The village of Lake Park has engaged J. F. Druar, of the Oscar Claussen Engineering Co., Commercial Building, St. Paul, as consulting engineer to prepare plans and specifications for a direct-current lighting system, consisting of pole line and wiring, oil engine and generator, building with future installation of battery system. Bids for the above will be awarded Sept. 16. Plans may be seen at the office of the village recorder, Lake Park, or at the office of the consulting engineer, Commercial Building, St. Paul. The cost of the plant is estimated at $10,000.

NEW ULM, MINN.—Contracts have been awarded by the City Council for addition to power station and new equipment for the municipal electric-light plant as follows: For addition to building to Otto Tappe, of New Ulm, at $1,740; for machinery, including 312-kva generator and engine (directly connected), switchboard, extensions, wiring, etc., 150-hp boiler and accessories, etc., to the Union Machine Co., of St. Paul, for $13,721, and smokestack to the Webber Chimney Co., for $2,390. The Oscar Engineering Co., Commercial Building, St. Paul, has charge of the engineering work.

RED LAKE FALLS, MINN.—Bids will be received at the office of the Board of Education, Independent School District No. 15, Red Lake Falls, until Sept. 22 for plumbing, heating, ventilating and electrical work of a 16-room school building. Copies of plans and specifications may be obtained from E. F. Broomhall, architect, 710 Alworth Building, Duluth, upon deposit of $15, which will be refunded upon return of same. Copies of plans will be on file in the Builders' Exchange of Duluth, at the office of the board and at the office of the architect. M. M. Watson is president of the board and I. Lemieux secretary.

ST. CLOUD, MINN.—The Public Ser. Co., of St. Cloud, expects to purchase within the next six months a 500-kw turbine engine directly connected to a 2300-volt, three-phase, 60-cycle generator. The company would like to secure good second-hand machines.

CEDAR FALLS, IA.—Within the next six months the town of Cedar Falls expects to erect a power house for proposed municipal electric-light plant and to purchase within from one to six months material for distribution system, including poles, transformers, arresters, wire, meters, insulators, poles and hardware; also steam pipes. Contracts have been awarded for engines, boilers and generators. C. H. Streeter is city engineer.

MAQUOKETA, IA.—Application has been made to the City Council by F. J. Cross, of Cedar Rapids, for a franchise to construct and operate an electric-light plant in Maquoketa. Mr. Cross, it is said, has secured a franchise in Anamosa and proposes to operate electric-light systems in Maquoketa and Anamosa and in the villages between these towns.

AVA, MO.—A franchise has been granted to J. W. Pettit & Co. to construct and operate an electric-light plant here. Power for operating the system will be secured at the old Wilson Mill, about 5 miles east of Ava. The cost of the plant is estimated at about $10,000.

CAPE GIRARDEAU, MO.—The Missouri Public Utilities Co., of Cape Girardeau, has applied to the State Public Service Commission for permission to purchase the light and power plant at Dexter, owned by Benjamin F. Eichholtz, and the public utility plants in Chaffee.

CLARENCE, MO.—The managers of the municipal electric plant expect to purchase within the next year a new engine directly connected to alternator. D. McIntire is superintendent.

KANSAS CITY, MO.—The Kansas City Terminal Co. has awarded the contract for construction of power house to the Fogel Construction

Co. The building will be 93 ft. by 196 ft., three stories high, and will furnish light, heat, power and air to the new union station and terminals. The cost of the power house exclusive of machinery is estimated at $180,000. John V. Hanna is chief engineer.

LOUISIANA, MO.—The Louisiana Lt., Pwr. & Trac. Co. expects to purchase within the next six months one 125-hp boiler and a 250-kw generating unit, consisting of an engine and generator. F. E. Murray is general manager.

MARCELINE, MO.—Within the next two months the managers expect to erect an addition to the municipal electric-light plant. New equipment has already been purchased, including two boilers, one feed-water heater, two Corliss engines and one boiler-feed pump from the Murray Iron Works Co., Burlington, Ia. L. A. Nickell is superintendent.

PLEASANT HILL, MO.—Application has been made to the Public Service Commission by Edward H. Crow, of St. Louis, for permission to purchase the property of the Reader Lt., Ice & Fuel Co., of Pleasant Hill, and for approval of contract with the city of Pleasant Hill to furnish street-lighting to that city. Mr. Crow proposes to organize a new company with a capital stock of $40,000 and to issue bonds to the amount of $35,000.

ALEXANDER, N. D.—Plans are being considered for the installation of an electric-light system in Alexander.

JAMESTOWN, N. D.—The contract for construction of a power house for the insane hospital at Jamestown has been awarded to J. W. Curren, of Valley City. The power plant will furnish electricity for lamps and motors and heat for all the buildings of the hospital, and will cost about $56,000.

LA MOURE, N. D.—The franchise granted to I. I. Bennett, of Sioux Falls, for the installation of an electric-light plant has been sold to M. A. Erickson, of Cashton, Wis.

DAVID CITY, NEB.—At an election held Aug. 30 the proposition to purchase the local electric-light plant, owned by the heirs of James Bell, at $7,000 was carried. Improvements will be made to the plant.

HARVARD, NEB.—The Harvard El. Co. expects to purchase a 35-kw, 220-volt direct-current generator within the next six months. A. W. Person is manager.

LOUISVILLE, NEB.—The Continental Gas & El. Corpn., of Cleveland, Ohio, has secured a 50-year franchise in the town of Louisville and is erecting a high-tension transmission line from Plattsmouth to Louisville. This line is a continuation of the distribution system which the company is building west from its Red Oak (Ia.) property, serving some 15 communities between Red Oak and Plattsmouth. An electrical distribution system is being built, including a street-lighting system, in Louisville. All contracts for materials have been let. Abbott & Eaton, Schofield Building, Cleveland, Ohio, are engineers in charge of the work.

RULO, NEB.—We are informed that the city of Rulo will not install an electric plant but will connect up with a transmission line. G. E. Johnson, of Falls City, Neb., is engineer in charge.

HOISINGTON, KAN.—Investigations are being made by the city officials with a view of building a power plant to operate the municipal water-works system and also possibly to install a municipal electric-lighting system.

KANOPOLIS, KAN.—Bids will be received by the city of Kanopolis until Oct. 6 for construction of water-works, complete, and alternating-current electric-light plant equipment. The equipment to be either steam-driven or oil-driven. Plans and specifications are on file at the office of the city clerk, Kanopolis, or at the office of Henrici, Kent & Lowry, engineers, 715 Reserve Bank Building, Kansas City, Mo. A deposit of $3 will be required for plans, to be refunded upon return of same. Bids may be submitted on any portion of the work.

LEBANON, KAN.—Rollins & Westover, consulting engineers, Midland Building, Kansas City, Mo., have been engaged to prepare plans for the installation of an electric-lighting system in Lebanon. Bonds to the amount of $18,000 have been voted for the plant.

TOPEKA, KAN.—We are informed that the power plant to be built in Topeka by the Atchison, Topeka & Santa Fé Ry. Co. will be constructed by the company's own force, material for same being ordered by M. J. Collins, general purchasing agent. R. A. Rutledge is chief engineer.

Southern States

CONCORD, N. C.—The Board of Electric Light Commissioners expects to erect within the next three months 1 mile of three-phase, 2300-volt transmission line and to purchase 25 lightning arresters. L. A. Fisher is superintendent.

MACON, GA.—The Board of Water Commissioners has signed a two-year contract with the Central Georgia Pwr. Co., of Macon, to operate the new 1,000,000-gal. pump at Tufts Springs pumping station.

CHIPLEY, FLA.—The Chipley Lt. & Pwr. Co. is building a power plant to furnish electrical service here. The equipment of the plant will consist of two 75-hp boilers, one 125-hp, four-valve Ball engine directly connected to a General Electric 75-kva, 60-cycle, 2300-volt generator. The street-lighting system will consist of 75 180-watt tungsten lamps. The company expects to purchase meters. E. M. Hale is engineer in charge.

GAINESVILLE, FLA.—The City Council has authorized an ordinance prepared to be presented at the next meeting of the Council for the installation of an ornamental street-lighting system in the business district.

MIDDLESBORO, TENN.—Investigations, it is reported, are being made by New York parties with the view of installing an electric plant for the purpose of furnishing energy to the coal mines in this district; also to build electric railways to adjacent mines and towns.

MOUNT PLEASANT, TENN.—The Mount Pleasant El. Co. expects to purchase within the next three months one double-ply leather belt for dynamo (18 in. by 100 ft.), one 66-in. by 16-ft. return tubular boiler (125-lb. pressure), both second-hand; also within the next six months ten 2200-volt lightning arresters and pole tape. E. N. Cunningham is lessee.

PULASKI, TENN.—The electric light committee may possibly purchase within the next few months a 125-hp oil engine and a 125-kva, three-phase, 60-cycle, 2300-volt generator and exciter (directly connected), motor and pump for unloading fuel oil from tank cars and for handling cooling water; also wire and fixtures for series tungsten street-lighting system. L. P. Thornburg is superintendent.

SHELBYVILLE, TENN.—The Duck River Pwr. Co., of Shelbyville, expects to put in operation within the next two or three weeks its new hydro-electric plant on Duck River, 5 miles from here. The equipment includes two new 44-in. Trump waterwheels, developing about 300 hp, equipped with Woodward governors, and a 200-kva General Electric alternator. The company has a three-phase transmission line into town. Several extensions have been made to its distribution lines this summer and several motor contracts taken, one of which is for pumping the city water.

SOUTH PITTSBURG, TENN.—The South Pittsburg Lt. & Pwr. Co., it is reported, is making improvements in its system in anticipation of receiving energy from one of the hydroelectric plants now being completed in this State.

ANNISTON, ALA.—The Alabama Pwr. Co. is building a substation in Anniston near the plant of the Anniston Foundry and Machine Works, to cost from $125,000 to $200,000. The equipment will include three 2000-kva transformers. Energy will be received from the Jackson Shoals plant, the Gadsden steam plant and from Lock 12 on the Coosa River. Part of the station is already in operation.

HUNTSVILLE, ALA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 24 for a conduit and wiring system and lighting fixtures at the United States court house and post office at Huntsville, Ala., in accordance with plans and specifications copies of which may be obtained at the above office or at the office of the custodian at Huntsville. O. Wenderoth is supervising architect.

JACKSON, MISS.—Bids will be received by the Mayor and Councilmen of the city of Jackson until Sept. 24 for the construction of two pumping stations and a mechanical filtration plant as follows: Contract 1, for constructing river intake, low lift station and main station; (2) constructing filtration plant complete with all equipment and appurtenances; (3) furnishing approximately 195 tons of 24-in. cast-iron pipe and specials; (4) furnishing five valves (6-in. to 30-in.); (5) furnishing and installing two 200-hp water-tube boilers, feed-water heater, feed pumps and steam piping complete; (5 A, B, C, D) furnishing and installing boilers and furnishing separately the heater, pumps and piping above mentioned in contract 5; (5 E) erecting heater, pumps and piping; (6) furnishing and installing one 4,000,000-gal. (per day) pumping engine and hand traveling crane; (7) one radial brick chimney; (8) moving from the existing station and installing in the new station two pumping engines and one boiler, together with all appurtenances and connecting piping; (9) furnishing and installing two motor-driven centrifugal pumps complete with piping, starting apparatus and wiring; also two motor-driven sump pumps; (10) furnishing and installing two 75-kw generators with switchboard and wiring and 2000 ft. of transmission line. Forms of proposals and specifications may be obtained upon application to Massena L. Culley, city engineer. Plans for pumping station may be secured from the city engineer upon deposit of $8; complete plans for a deposit of $15. Each proposal must be made on the proposal form. George W. Fuller, 170 Broadway, New York, N. Y., is consulting engineer.

HOT SPRINGS, ARK.—In the recent fire all the generating units of the electric-light and street-railway companies of Hot Springs were destroyed, but the boilers can be made serviceable. Temporary service is expected within two weeks. The electric pole line and wire system throughout the burned district was destroyed by fire and the overhead trolley system damaged for 1 mile. S. E. Dillon is general manager of both companies.

CHECOTAH, OKLA.—The Checotah Wtr., Lt. & Ice Co. will build a modern steam laundry plant on the plant grounds, to be operated in connection with the other properties. L. B. Griffing is secretary and treasurer.

BRENHAM, TEX.—The Brenham Compress Oil & Mfg. Co. expects to purchase some electric ranges and current supplies. James C. Kennedy is secretary.

DALLAS, TEX.—The Texas Pwr. & Lt. Co., of Dallas, is extending its transmission lines to cotton gins and other industrial plants in North Texas.

DALLAS, TEX.—The Standard-Tilton Milling Co., of St. Louis, Mo., has awarded contracts for the erection of a plant, including flour mill, grain elevator, power house, warehouse and storage building, to cost about $300,000. The plant will have a capacity of 2500 barrels of flour and 600 barrels of cornmeal. The mill and elevator buildings, the latter to have a capacity of 300,000 bushels, will be erected by the McDonald Engineering Co., of Chicago, Ill.; the machinery will be furnished by the Barnard A. Leas Machinery Co., of Moline. The power house will be equipped with a Diesel engine.

DENTON, TEX.—Within the next 12 months the managers of the municipal electric-light plant expect to purchase one electric generating unit and boiler, two carloads of poles, transformers and lightning arresters and one tub transformer. W. J. Grady is superintendent.

LINDALE, TEX.—The installation of an electric-light plant in Lindale is under consideration. J. D. Nance, of Dallas, and others are interested in the project.

PALESTINE, TEX.—The electric plant of the Texas Pwr. & Lt. Co., of Palestine, was recently damaged by fire, causing a loss of about $30,000.

Pacific States

EATONVILLE, WASH.—Bids wil be received by the city clerk, Eatonville, until Sept. 26 for construction of a hydroelectric power plant in accordance with plans prepared by the Evans-Dickson Co., 734 Commerce Street, Tacoma, Wash.

EPHRATA, WASH.—Application has been made to the City Council by William F. Scheffel and Thomas J. Smith for a 25-year franchise to furnish electricity for lamps and motors in Ephrata; also water for domestic and fire purposes. They have appropriated water rights of the overflow and springs of Beasley Canyon for the purpose of storing water for irrigating purposes in the Ephrata Valley and generating electrical energy.

MOUNT VERNON, WASH.—The Pacific Northwest Trac. Co., of Mount Vernon, it is reported, contemplates erecting a transmission line out from Allen via Avon and the Olympia Marsh district to West Mount Vernon. The company is controlled by the Stone & Webster Management Association, of Boston, Mass.

TACOMA, WASH.—The Puget Sound El. Co. is contemplating leveling its tracks and installing a block signal system on the interurban lines between Tacoma and Seattle, involving an expenditure of about $60,000.

TACOMA, WASH.—Bids will be received by the board of directors of Tacoma School District No. 10 until Sept. 24 for the installation of power plant and heating plant for the Lincoln Park High School building in accordance with plans and specifications prepared by Heath & Gove, architects, and Leigh Allen, engineer, National Realty Building, Tacoma. Separate bids must be submitted for each plant. Alfred Lister is secretary.

YACOLT, WASH.—The Northern Clarke County Lt. & Pwr. Co., of Yacolt, expects to purchase within the next six months a vertical engine (10-in. by 12-in. cylinder), also a boiler for use during peak load.

GOLD HILL, ORE.—The substation of the California-Oregon Pwr. Co. in Gold Hill was destroyed recently by fire, causing a loss of about $7,500. The station, it is understood, will be rebuilt and a new transformer installed.

LEBANON, ORE.—The Santiam Pwr. Co., it is reported, contemplates the development of the water-power of the falls at Waterloo. Power developed at the plant will be used to operate the Lebanon paper mills.

PORTLAND, ORE.—Plans have been filed by the Northwestern El. Co. for the erection of an eight-story steel building at Tenth and Washington Streets, to cost $750,000. The central station of the new heating plant now being installed will be located in the basement of this building.

SHERIDAN, ORE.—Improvements, it is reported, will be made to the plant of the Sheridan Lt. & Pwr. Co., including the installation of an additional boiler, etc.

COVINA, CAL.—The Home Tel. Co. has received permission from the State Railroad Commission to issue $90,000 in bonds, the proceeds to be used for discharging indebtedness and for making improvements.

LAKE TAHOE, CAL.—The Stone & Webster Engineering Corpn. of Boston, Mass., is reported to have been given permission by the United States government to construct a dam across the outlet of Lake Tahoe. The proposed dam will be 125 ft. wide, with a waterway 109 ft. long and 14 ft. deep, and will cost about $40,000.

SAN FRANCISCO, CAL.—The Board of Harbor Commissioners has approved the recommendation of Jerome Newman, chief engineer of the Harbor Commissioners, that arrangement be made for electric wiring and lighting of Piers 26, 28, 30 and 32, which are now nearing completion. The present plans provide for the use of 250-watt tungsten lamps, to cost about $2,000 per pier. Work on installation of the system, it is understood, will begin at once.

ST. ANTHONY, IDAHO.—Application has been made by the Ashton & St. Anthony Pwr. Co., capitalized at $250,000, to the State Public Service Commission for a certificate of convenience and necessity. The company proposes to build its main power plant on the Snake River, 2 miles west of Ashton.

ANACONDA, MONT.—The Anaconda Copper Mining Co. is planning to install a 10,000-ton electric precipitation plant, at the Washoe smelter.

LARAMIE, WYO.—The Laramie El. Co. expects to purchase within the next 30 days a coal conveyor. A. E. Anderson is superintendent.

DENVER, COL.—The Continental Mines, Pwr. & Reduc. Co., 401 First National Bank Building, Denver, expects to erect within the next few months from 2 to 5 miles of transmission lines and to purchase motors, transformers and switching equipment necessary for above extension; also air compressors. Henry I. Seamann is president and manager.

LA VETA, COL.—The La Veta Lt., Ht. & Pwr. Co. has leased the La Veta Roller Mills and water-power rights for a period of three years and will operate same in connection with the electric-light plant. C. C. Webster is manager.

GALLUP, N. M.—The Gallup El. Lt. Co. has recently put in operation a 200-kw, three-phase, 60-cycle, 2300-volt generating unit, changing the system entirely to alternating current. The old direct-current equipment is being removed to make room for a duplicate alternating-current unit. Kenneth H. Meyers is manager.

Canada

VANCOUVER, B. C.—The British Columbia El. Ry. Co., of Vancouver, expects to replace the wooden poles with steel towers on its high-tension transmission line extending from Lake Buntzen to Barnet.

VICTORIA, B. C.—Notice has been filed in the office of the water recorder by the British-Pacific Hydro-Electric & Tramways Lt. Co., of Victoria, that application will be made for use of 1000 cu. ft. per second of water of the Nimpkish Creek. The water will be stored in Nimpkish Lake and River by means of a dam to be built about 1 mile from sea and will be used for industrial purposes. G. Gray Donald is agent for the company.

SOURIS, MAN.—Plans are being considered by the Town Council for the installation of a municipal electric-lighting system, to cost about $40,000.

BRANTFORD, ONT.—Contracts have been awarded by the city of Brantford for the erection of a substation in Brantford. The transformers and switching equipment will be purchased by the Hydro-Electric Power Commission of Ontario.

ELORA, ONT.—The cost of installing a complete distribution system for distributing hydroelectric power in Elora is estimated (roughly) by the Hydro-Electric Power Commission at $10,000.

HAMILTON, ONT.—The contract for building the Hydro-Electric Power Commission underground system in Hamilton has been awarded to G. M. Gest, of Montreal, Que., for $177,822.

SAULT STE. MARIE, ONT.—The power plant of the Lake Superior Pwr. Co., of Sault Ste. Marie, was recently struck by lightning, causing much damage to the plant.

TORONTO, ONT.—To meet the demand for additional energy the Hydro-Electric Power Commission of Toronto has found it necessary to build an addition to the transformer station on Strachan Avenue. A permit has been issued calling for the construction of a two-story brick, steel and concrete building, to cost $35,000.

WOODVILLE, ONT.—On Aug. 13 a by-law authorizing the expenditure of $4,000 for the installation of a distribution system was carried.

ST. JEROME, QUE.—The City Council, it is reported, is contemplating improvements to the electric-lighting system, to cost about $24,000.

SHERBROOKE, QUE.—The city has recently acquired the Lomas power right on the Magog River, situated above the present municipal power station. This opens the way for a further development which may be rendered necessary in the near future.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until Oct. 6 for furnishing centrifugal pumps, valves, piping, hydraulic operating tables, traveling cranes, air compressors, switchboard complete, with all electrical instruments and equipment, as per circular 796. For further information address Major F. C. Boggs, general purchasing officer.

SALTILLO, COAHUILA, MEX.—The Saltillo El. Lt. & Pwr. Co. expects to erect within the next six months an automatic telephone system in this city, and within the next 18 months a hydroelectric power plant with transmission line 100 miles long; also to purchase within the next six months switchboard equipment for above telephone system, overhead and underground lead-covered multiple telephone cables, having from 25 to 500 pairs of wires, and supplies for electric-light system. A. W. Lilliendahl is president and manager.

New Incorporations

MONTGOMERY, ALA.—The Alabama Pwr. Co., a consolidation of the Alabama Pwr. Co., the Alabama El. Co., Wetumpka Pwr. Co., Alabama Pwr. & El. Co. and Alabama Pwr. Devel. Co, has been organized, with a capital stock of $20,000,000. John Mitchell, of New York, N. Y., is president.

WILMINGTON, DEL.—The Southwestern Cities El. Co. has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $6,000,000. The incorporators are: H. E. Latter, O. J. Reichard and E. B Davis, of Wilmington.

PORTLAND, MAINE.—The Idaho El. Co. has been chartered under the laws of the State of Maine with a capital stock of $12,000,000. The company proposes to generate, transmit and distribute electricity. T. L. Croteau is president and A. A. Richards treasurer, both of Portland.

WELLINGTON, MO.—The Wellington Lt. & Pwr. Co. has been incorporated with a capital stock of $6,000 by Walter J. C. Westerman, W. H. Breuer and H. H. Neese.

NEW YORK, N. Y.—The Elmira Transmission Corpn. has been incorporated with a capital stock of $10,000 for the purpose of carrying on an electrical power business, etc. The incorporators are: F. G. Robinson, 825 West 179th Street; Henry Morgan, 44 East Eighty-first Street, and G. H. Olney, 59 East Ninety-first Street, New York City.

TULLAHOMA, TENN.—The Tennessee Utilities Co. has been incorporated by G. M. Whitson, President, and L. E. Womack, secretary. The company is capitalized at $25,000 and proposes to build a hydroelectric power plant on Elk River in Franklin County. Present plans provide for the development of about 20,000 hp.

KERENS, TEX.—The Kerens Lt. & Pwr. Co. has been chartered with a capital stock of $15,000 by S. E. Bergstron, R. H. Daniel, W. T. Stockton and others.

SEATTLE, WASH.—The Lake Forest Lt., Wtr. & Pwr. Co. has been incorporated with a capital stock of $10,000 by A. H. Reid, E. Soelberg and others.

MOUNT HOPE, W. VA.—The Mount Hope Pwr. Co. has been incorporated with a capital stock of $25,000 by John Faulkner, B. Rurvitz, T. L. Feazel and others.

ALMOND, WIS.—The Almond El. Co. has been incorporated with a capital stock of $10,000 by William Brunker, Oscar Culver, S. E. Ralph and A. A. Lepper.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 2. 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,071,710. LIGHTNING ARRESTER; E. E. F. Creighton, Schenectady, N. Y. App. filed Dec. 22, 1906. Multi-gap type of high potential.

1,071,737. SWITCH; G. W. Hart, West Hartford, Conn. App. filed July 7, 1910. Remote-controlled switch closed by a solenoid.

1,071,769. CIRCUIT CONTROLLER; H. McCready, Wilkinsburg, Pa. App. filed March 29, 1911. Railway signal relay.

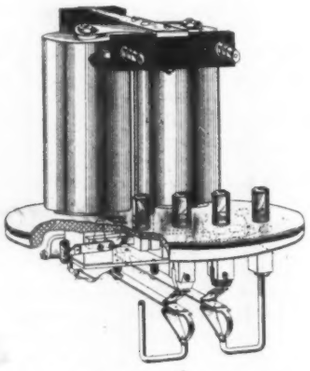
1,071,770. MOTOR-CONTROL SYSTEM; R. H. McLain, Schenectady, N. Y. App. filed Nov. 25, 1912. Series-field protection for Ward-Leonard system.

1,071,778. SYSTEM OF MOTOR CONTROL; W. Naumann, Berlin, Germany. App. filed June 10, 1908. For hoisting motors.

1,071,807. ELECTRICAL INTERLOCKING MECHANISM; J. L. Schureman, Chicago, Ill. App. filed Aug. 21, 1908. Starting device with rotary shaft-carrying crank.

1,071,819. COMBINED TYPEWRITER AND TELEGRAPH TRANSMITTER; H. H. Steele, Marcellus, N. Y. App. filed May 11, 1908. Attachment for an ordinary typewriter.

1,071,838. MAGNETIC SEPARATOR; J. Weatherby, New Cumberland, Pa. App. filed Jan. 11, 1912. Fixed and rotary pole pieces.



1,071,769.—Circuit Controller.

1,071,839. ORE CONCENTRATOR; J. Weatherby, New Cumberland, Pa. App. filed Aug. 1, 1912. Magnetic separator for pulsating or shaking separating tables.

1,071,840. MOTOR CONTROL; M. A. Whiting, Schenectady, N. Y. App. filed Oct. 19, 1911. Retarder for motor-operated winches, etc.

1,071,843. RESISTANCE GRID; H. J. Wiegand, Milwaukee, Wis. App. filed June 6, 1910. Insulating reinforcing frame.

1,071,844. REINFORCED-GRID RESISTANCE; H. J. Wiegand, Milwaukee, Wis. App. filed May 25, 1911. U-shaped strip for convoluted grid.

1,071,871. FUSE PLUG; R. C. Bronson, Chicago, Ill. App. filed May 9, 1912. Successive strips.

1,071,884. AUTOMATICALLY OPERATED ELECTRIC SIGNALS FOR RAILWAYS; W. H. Cook, Denver, Col. App. filed July 18, 1910. Locking device for a semaphore.

1,071,886. ELECTROMAGNETIC SWITCH; A. S. Cubitt, Rugby, England. App. filed May 16, 1910. Dash-pot for timed delayed actions.

1,071,905. ELECTROMAGNETIC DEVICE; M. F. Geer and R. C. Leake, Rochester, N. Y. App. filed Oct. 26, 1911. Armature support for electric bell

1,071,920. DYNAMO-ELECTRIC MACHINE; A. Hill, Warminster, Eng. App. filed Feb. 23, 1911. Self-regulating auxiliary brush type.

1,071,975. ORE CONCENTRATOR; J. Weatherby, New Cumberland, Pa. App. filed Jan. 4, 1913. Concentrated fields with pulsating table.

1,071,978. DEVICE FOR REMOVING HAIRS; J. E. White, Rochester, N. Y. App. filed April 11, 1912. Tweezers with electric terminals.

1,072,009. SECTIONAL BOX; J. Keefe, Boston, Mass. App. filed Oct. 17, 1910. Screwless outlet box with interlocking corners.

1,072,014. TROLLEY STAND AND POLE; A. C. Kudla, Meriden, Conn. App. filed March 7, 1913. Pivoted vertical pole.

1,072,030. RAIL-CIRCUIT-CLOSING CONTACT; F. Prochaska, Charlottenburg, Germany. App. filed June 17, 1909. Mercury type with heavy top plate.

1,072,036. ARMATURE WINDING FOR ELECTRICAL MACHINES WITH COMMUTATORS; R. Richter, Charlottenburg, Germany. App. filed Aug. 7, 1906. Non-inductive resistance and active conductor coils.

1,072,042. TRANSFORMER CONNECTION; K. Schmidt, Berlin, Germany. App. filed Aug. 25, 1911. The number of turns of the various groups of winding forms a geometrical series.

1,072,074. PUSH-BUTTON SYSTEM; W. Baxter, Jr., Jersey City, N. J. App. filed Nov. 19, 1908. For preventing sparking of elevator switches.

1,072,083. MOTOR-CONTROLLING SYSTEM; E. R. Craichoff, East Orange, N. J. App. filed May 18, 1905. Single push-button automatically controlled elevator.

1,072,091. PROCESS FOR PROTECTING IRON SURFACES FROM CORROSION; S. O. Cowper-Coles, Westminster, London, Eng. App. filed Nov. 23, 1912. Electrode deposition of pure iron and then zinc.

1,072,120. ARMATURE FOR MAGNETO INDUCTION MACHINES; G. Honold, Stuttgart, Germany. App. filed Oct. 4, 1909. The coils are inserted after winding.

1,072,132. ACCELERATING DEVICE FOR ALTERNATING-CURRENT MOTORS; W. D. Lutz, Allendale Borough, N. J. App. filed Jan. 7, 1911. Opposed windings for accelerating in proportion to the speed.

1,072,154. CULINARY APPARATUS; E. J. Covington, Los Angeles, Cal. App. filed Nov. 8, 1911. Coffee percolator for use in a cup.

1,072,170. ELECTRIC-COOKING DEVICE; C. E. Sargent, Chicago, Ill. App. filed May 20, 1911. "Fireless" type.

1,072,177. CIRCUIT-BREAKER FOR ELECTRIC CIRCUITS; F. L. Sessions, Columbus, Ohio. App. filed Feb. 25, 1904. Delayed action with carbon terminals.

1,072,178. CIRCUIT-BREAKER; F. L. Sessions, Columbus, Ohio. App. filed Oct. 9, 1905. Adjustable magnetic tripping device with indicator.

1,072,205. PRODUCTION OF LEAD OXIDES; O. W. Brown and A. R. Nees, Bloomington, Ind. App. filed Sept. 9, 1912. It is heated between 325 deg. and 440 deg. C.; for storage-battery plates.

1,072,224. SWITCH HANDLE; G. W. Goodridge, Bridgeport, Conn. App. filed Dec. 1, 1911. Metal shell.

1,072,227. ELECTRIC HEATER; F. J. Holmes, Chicago, Ill. App. filed May 24, 1909. Mechanical construction of curling tongs.

1,072,228. ARMATURE FOR MAGNETO INDUCTION MACHINES; G. Honold, Stuttgart, Germany. App. filed Oct. 4, 1909. A bobbin for receiving a previously wound coil.

1,072,252. TROLLEY-POLE AND BRAKE CONTROL; J. E. Peck, Logan, W. Va. App. filed Jan. 12, 1912. Pneumatic operation.

1,072,271. ELECTRIC-LAMP SOCKET; G. B. Thomas, Bridgeport, Conn. App. filed Feb. 23, 1912. Pull-switch insulation.

1,072,279. STARTER APPARATUS AND SYSTEM FOR AUTO-VEHICLES; R. Varley, Englewood, N. J. App. filed Nov. 14, 1912. Automatic disconnection of the starting motor and engine.

1,072,383. ELECTRIC TRAIN-CONTROLLED SYSTEM FOR RAILWAYS; F. T. Jones, Baltimore, Md. App. filed July 5, 1910. Block system for signaling and setting brakes.

1,072,400. AUTOMATIC BATTERY CUT-OUT FOR TELEPHONE CIRCUITS; A. R. Nelson, Janesville, Cal. App. filed May 8, 1913. Sub-station interlock for party-line.